

July 10, 1961

# Aviation Week

*and Space Technology*

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On Turbofan  
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#### AVIATION CALENDAR

July 17—Air Force Contract Aviation Sensors Symposium, National Aeronautical Service Center, Hanscom Field, Waltham, Mass. D.C.

July 19-21—Orlando Meeting Avionics Electronics, Engineering, Components, Avionics, Inc., Edna Rae Hotel, Orlando, Fla.

July 20-21—Quarterly Regional Meeting, Los Angeles Technical Aviation, Glendale Park Inn, Glendale, Calif. N.C.

July 22-24—Annual Meeting, American Assn. of Airport Executives, Northeast Chapter, Wilmington, Del.

July 24-26—Air Traffic Control Products Symposium, Electronic Measurement Engineering Assn., Mayflower Hotel, Washington, D.C.

July 25-26—13th International Trade Fair and Aviation Exhibition, McCormick Place Exposition Center, Chicago, Ill.

July 26-28—Annual Convention, National Aviation Trade Assn., Dennis Hotel, Miami, Fla.

July 28-30—11th Conference on Physics of the Solid State and Related Disciplines for Interference with Conference Dates for Room 200, Hotel Virginia, Princeton Institute, Princeton, N.J.

Aug. 1-3—Fourth Western Regional Meeting, American Astronautical Society, Statler Hotel, San Francisco, Calif.

Aug. 14-19—35th Annual U.S. National Science Championships, Wethers Key Inn, 3000 Wethers Key, Miami, Fla. Approx. 2,000 students from 400 colleges for Hydronics, Physics, Test, Mechanics, American Society for Testing

(Continued on page 8)

#### AVIATION WEEK and Space Technology

July 15, 1961  
 Vol. 73, No. 2

**CEC** (Continued from page 1)

and the other two, the 4-225 and 4-226, are the result of the company's extensive experience in the field of pressure transducers. The 4-225 is a low-range unit for pressure ranges of 0-15 psig through 0-90 psig absolute. Standard ranges are 0-15, 20, 30 and 35 psig absolute. Type 4-226 (tubular) is a high-range unit for pressure ranges of 0-100 psig through 0-5000 psig absolute. Standard ranges are 0-200, 350, 500, 600, 1000, 1500, 2500 and 5000 psig absolute.

Here are some of the specifications they have in common:

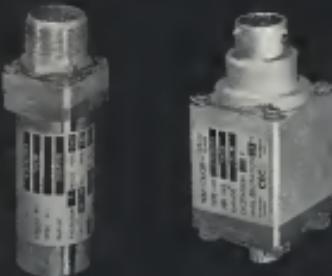
Best absolute stability:  $\pm 0.01$  psig at  $70^{\circ}\text{F}$ . Input impedance: 700 ohms minimum. Output frequency: 0.25 Hz.

Linearity:  $\pm 0.02$  psig over a 100 psig full scale range and 17°F.

Compensated temperature range:  $-50^{\circ}\text{F}$  to  $+250^{\circ}\text{F}$ .

Weight: 0.5 lb. max. exclusive of sealing electrical connector.

For more information and complete specifications, call your nearest CEC sales and service office or write for Bulletin CEC 6225-X2 or 6226-X2.



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## AVIATION CALENDAR

(Continued from page 5)

Aug. 3-6—North Central States, AIA  
Managers Conference, Mason City, Iowa  
Aug. 7-9—Concord and Niagara Falls  
Area, American Radiator Company, Buffalo  
University, Palo Alto, Calif.  
Aug. 21-27—General Engineering Conference,  
University of Michigan, Ann Arbor  
Aug. 16-18—International Hypersonic Con-  
ference, American Rocket Society, MIT,  
Cambridge, Mass.  
Aug. 19-21—Midwest Chapter of the Association  
of Engineers Meeting, San Diego, Calif.  
(Cancelled)  
Aug. 22-24—Western Electronic Show and  
Convention, City Palace, San Francisco  
Aug. 25-26—Foothills Annual Convention  
of the American Society of Mechanical  
Engineers, Pasadena, Calif.  
Aug. 24-26—Southwest Annual National Re-  
union, Biltmore Hotel, Atlanta, Ga.  
Aug. 26-28—11-Third Annual Seminar for  
Confidence Assessors, Institute of Mining, Metallurgical and Petroleum En-  
gineers, Ambassador Hotel, Los Angeles  
Sept. 4-10—Flight Display and Exhibit  
Joint, Bureau of Reclama Aircraft Control  
and Safety, Los Angeles, Calif.  
Sept. 4-6—Eighty-Fifth Annual American As-  
sociated Conference, Royal Astronomical  
Society and Institute of the Royal  
Astronomers, London, England. W. H. Wil-  
liams Memorial Lecture, Sept. 12.  
Sept. 5-7—International Symposium on Space  
Electronics and Technology, Institute of  
Radio Engineers, University of New  
Mexico, Albuquerque, N.M.  
Sept. 10-12—National Convention, National  
Aeronautics Assn., Washington, D.C.  
Sept. 13-14—Aerospace Operations and  
Maintenance Symposium, Aeronautics Corp.,  
Midvale, N.J.  
Sept. 19-21—North Annual Joint Societies  
Engineering Management Conference  
in Hotel New Yorker, Hotel Name  
and New York, N.Y.  
Sept. 19-21—Annual Conference, National  
Assn. of State Aviation Officials, Miami  
Beach, Fla.  
Sept. 28-29—National Convention and Auto-  
motive Service Assn. of Four Areas, Phila-  
delphia, Pa.  
Sept. 26-28—Annual Convention, National  
Business Assn., Assn., Mayo Hotel,  
Tulsa, Okla.  
Sept. 29-30—Society of Experimental Test  
Pilots, Fall Annual Symposium (including  
a Forum on the Strategic Transport) and  
Aircraft Rescue, Beverly Hills Hotel,  
Beverly Hills, Calif.  
Oct. 27-28—International Astronomical  
Congress, Washington, D.C.  
Oct. 9-10—American Rocket Society's 16th  
Annual Meeting and Space Research  
to the National Coliseum, New York, N.Y.  
Oct. 14-22—Federation Astronautique Internationale  
1961 General Conference, Hotel  
de l'Orangerie, Rue de la Paix, Paris  
Oct. 21-22—Joint Meeting, Canadian Assoc.  
of Aeronautics and Space Institute, the AIAA  
and the Society of Canadian Engineers,  
Montreal, Quebec, Canada  
Oct. 25-27—75th Annual General Meeting  
International Air Transport Assn., Sydney

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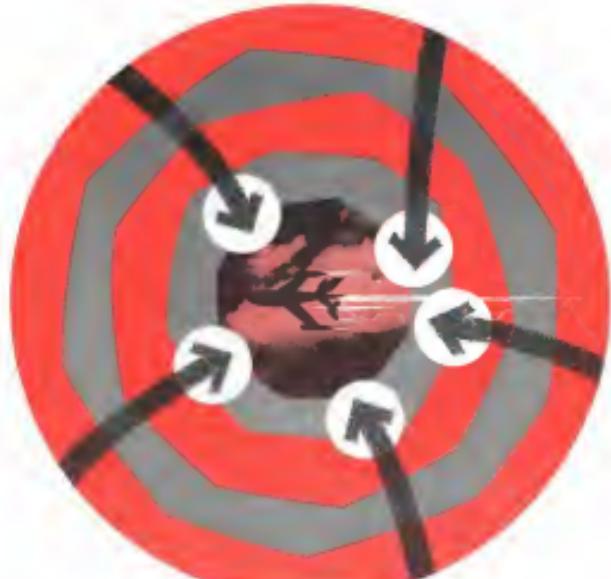
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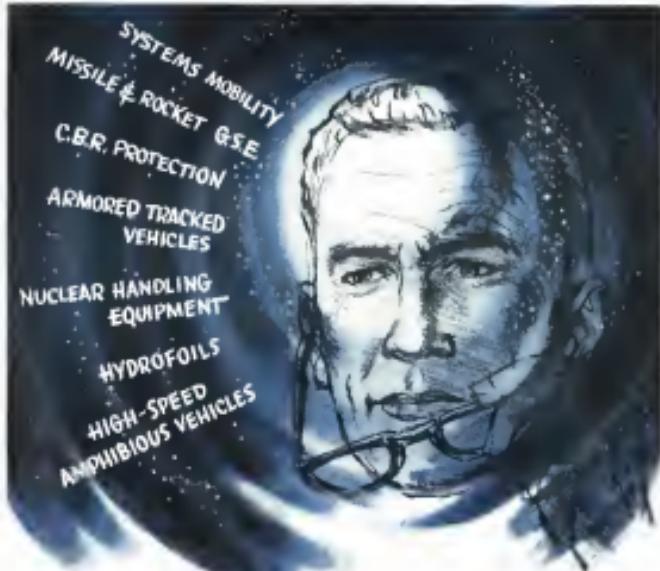
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GESAC has already been successfully flight tested aboard the Convair F-106 under Navy Bureau of Weapons sponsorship. Application of this fully adaptive system profiles have been conducted in the North American NASA X-15 Simulator under Air Force contract, with outstanding success. A flight evaluation on the McDonnell F4H-1 is currently in progress under Navy BuAer contract. GESAC provides another example of General Electric's Electronics Department leadership in aerospace electronics.

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Purer the spend, more varied the mission—the more critical are the structural requirements. Such is the Navy's newest all-weather, nuclear weapons carrying aircraft—the carrier-based A-3J Vigilante.

Because of their excellent residual residual preload characteristics, Hi-Loks were selected for use throughout the A-3J primary structure. The unique Hi-Lok torque-up feature produces a high, uniform clamp-up of high tensile sheet materials in off-grip conditions. The installation method is smooth and quiet. Inexpensive, lightweight, Hi-Lok roofing reduces worker fatigue and avoids the need for heavy square or bulky pull-type equipment and their limitations in close quarters. In open areas, Hi-Loks can be installed at speeds up to 45 per minute.

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**RIGHT:** Hi-Loks are being installed in the A-3J rear fuselage with Hi-Lok right-angle tooling adapted in a Relentless Weapons Plane. Other Hi-Lok adapter tooling is available as strength or weight requirements demand. **ABOVE:** Hi-Lok torque-up feature provides residual load transfer from the aircraft shoulder mountings of high performance aircraft such as the Vigilante.



**ABOVE:** In strength and temperature range, the A-3J rear fuselage sheet metal Hi-Lok pins (225,000 psi shear at 290°F) are bonded with shanks made to 2000 Hi-Lok torque-up feature. Other Hi-Loks can be used in 400°F. After proper installation, the Hi-Lok pins shear at 140,000 psi shear at 140,000 psi shear at 140°F. After proper installation, the Hi-Lok pins shear at 140,000 psi shear at 140°F, as well as load ratings to -300° below zero.



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**Ride for a B-52...** MICKERS hydrostatic drives assist positive traction on icy airstrips

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July 12, 1941

# Aviation Week and Space Technology

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Fig. 204 shows all the new material

## A Major Mistake

The United States made a major policy mistake in abandoning high priority for advanced manned aircraft development and accepting at face value Nikita Khrushchev's statement that the Russians are pursuing the same policy to concentrate on ballistic missiles. This has become evident during the rehearsals for the 1961 Tashkent air show scheduled to be flown yesterday over Moscow. In the month long rehearsals for the show, Western observers perché on the railroad embankment that borders the granite Tashkent field were able to identify three new supersonic bombers, two new Mach 2-plus fighters, a new jet seaplane, a flying crane helicopter and a transport plane the size of a DC-4 transport.

They also were able to note that the Red Air Force has equipped all of its latest operational fighters, such as the all-surface version of the supersonic Fencer and Mach 2 Firthed, with air-to-air and infrared guided missiles and has modernized its long bomber fleet of Bear, Bear, Badger with air-to-ground missiles with ranges up to 300 m, supersonic speeds and radar guidance.

Least of the three new supersonic bombers is Bounder (AW Dec. 1, 1958, p. 27; July 3, p. 27), an intercept large aircraft of 8.56 m. At its present cost, Bounder has high subsonic cruise capability with supersonic dash performance as the target area. It is built to take advanced powerplants, such as nuclear heat sources for its large turbojet engine. The Zvezda is its non-nuclear-powered version, an intercept long-range bomber using a ground threat to the North American air defense system. In its nuclear-powered version, it would be a multi-thrust missile launcher, early warning center and ECM station.

Next down the scale comes a bimotor new design that mounts two large turbines on each side of the central tail fin and whiskers an extremely thin delta wing. This Mach 2 bomber is larger than the Convair B-58 and also is in the heavy class with intercontinental range from refueling.

The third supersonic bomber, Blinder, is in the medium class and appears to be a highly advanced development of Yakovlev's earlier Biplane (AW Jan. 26, 1958, p. 38). It has shoulder-mounted wings with a sharp, swept wing and looks as though it could swish Mach 2 or top speed.

Whether there were further surprises in store for observers of the Tashkent show was not yet apparent at this writing. But the appearance of these three supersonic bombers makes clear the folly of abandoning the F-105 fighter project, aimed at developing a long range Mach 3 interceptor as part of the B-70 program, and of allowing the air defense of North America to slide into obsolescence on the grounds that the Soviet nuclear bomber threat would never grow beyond the subsonic Bear and Blinder.

The Bear and Blinder fleet is now a raw and nameless potential threat in a second wave follow-up behind the supersonic bombers, hurling their nuclear missile loads onto targets far beyond the range of the Nike Hercules missile and against a third tier of supersonic de-

feat of F-105 and F-101 fighters over-intimated by the first supersonic waves of attack.

Even the dubious DEW, radars and Predictor lines and the SAGE system have not been modernized to handle supersonic bomber attacks. Plans to do so were scrapped several years ago by the same defense officials who killed the F-105 development, cut down the F-106 Mach 2 interceptor program and stalled the Binson B missile force.

The two new Mach 2-plus long-range interceptors displayed during the Tashkent rehearsals, plus the modernization of F-105, Fitter, Fencer and Farmer fighters with infrared and radar-guided air-to-air missiles, indicate a vastly increased air defense capability against Strategic Air Command's B-52 bombers and highlights the pitiful small number of supersonic B-58s now programmed for the SAC fleet. It also shows that the slowdown of the B-70 development program was the shortest stepback.

These new developments also indicate that the Soviets are not relying entirely on ground-to-air missiles for their air defense. These missiles represent only the outer defense ring. The long-range interceptors equipped with infrared radar, guided missiles and Mach 2-plus speed in heat threat quarry are the inner outer layers on which the Soviets count for the significant striking of attacking bombers.

Both the launch of supersonic bombers and this third generation of supersonic fighters indicate that the Soviet expansion with ICBM technology must be paralleling our own and that, despite Mr. Khrushchev's nuclear sitting, they are still depending on the nuclear bomber as their first line of long-range offense. It also indicates they do not rate the effectiveness of our B-58 attack capability very high and are more worried about the delivery capability of the SAC bomber fleet.

The initial bulk of continuing advanced manned aircraft development occurred as the Eisenhower Admin. administration in the face of official USAF warnings that this policy was foolhardy. But it has been enthusiastically endorsed in the Kennedy Administration in general and in particular by Robert McNamara, his Secretary of Defense.

Only in Congress where the sage counsel of Representatives Carl Vinson and George Mahon and Senators Russell Synder and Jackie Speier prevailed, did the case for the continued development of manned bombers get a hearing. And we doubt whether these politicians of Congress, in the midst of passing on the Fiscal 1962 defense appropriation and authorization bills, were given much information on the ominous new best that disclosed Moscow does in fact.

We recommend that Congress and the American people demand the truth about the new Soviet airbase threat and that they earnestly inquire into who we made the terrible mistake of virtually abandoning advanced aircraft development to put off all of our eggs in the ICBM basket long before the proton souped-up orbital reliability and technical maturity—and what our leaders propose to do about it now.

—Robert Holt

# The satellite with the stop-and-start engine



The Agni B's main engine ignites and delivers a sustained velocity after first-stage booster has cut out and disappears.



Radio signals from earth start and stop Agni. It begins to build up original velocity to hit into new elliptical orbits.

**LOCKHEED**  
MISSILES & SPACE DIVISION, SANTA MONICA, CALIFORNIA



Instrument and test equipment being calibrated here on 14-ton static-cut-wheel test bench from Ballistic division

## TI's ELECTRO-OPTICAL SYSTEMS CAPABILITY



**MINSTEYER**  
Instrument shown here is the Minsteyer, an electro-optical alignment system. It's used to align the optical axis of Minsteyer with the optical axis of the telescope or other optical system in which it's inserted. The useful range of which the detector is measured from input reference is less than 2 seconds at 1000 and within 10 seconds at 10,000 ft.



**NIKE-ZEUS**  
Optical assembly for the Nike-Zeus missile shown. It's a three-lens telescope system designed to track the missile's position and to detect the infrared energy of reentry heat. It's a two-axis system. It's one of the systems that the company is developing.



**POLEARIS**  
Optical assembly for the Polaris missile. It's a three-lens telescope system designed to track the missile's position and to detect the infrared energy of reentry heat. It's a two-axis system. It's one of the systems that the company is developing.

**Precision optics, electronics and mechanics** are being combined at Texas Instruments into new high-accuracy alignment, calibration and tracking systems for advanced programs such as Minsteyer, Polaris and Nike-Zeus. This capability began in 1960 when TI integrated complete optical facilities and the skills of veteran craftsmen with the company's total corporate capability which includes development of complex military electronic and mechanical apparatus plus basic and applied research and manufacture of ultra-pure optical materials and detectors. This unique technology has now been extended into the fields of navigation, stabilization, detection, tracking, communications and energy conversion. For information on your specific electro-optical requirements, contact MARKETING DEPARTMENT.



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## WHO'S WHERE

### In the Front Office

**Neil M. Blau**, president, Aerophase Bags F.M.R. Division, Woodside, N.Y. succeeds **Baron Hillman**, who will continue as head of division.

**Ed. Gen. Charles E. Boggs** (USA, ret'd) will be Vice Chairman, D.C., and President of General Telephone & Electronics Corp., succeeding **Wes Adams**. **Frederick J. Bill** (USA, ret'd) resigns.

**Donald C. Schatz**, vice president, Value Electronics Sales Group, Md., a division of **Teletronics Corp.** of America.

**Alfred F. Bell**, vice president, Sales, United States International, East Hartford, Conn.

Thomas G. Government, vice president sales and marketing, Action Industries Inc., White Plains, N.Y. **Alvin George B. Haase**, vice president, marketing, Beck M. Roads, resigns.

**E. Gardner Belmont**, assistant vice president for vehicle development, American Airlines, Inc.

**Wing Sorenson**, Inc., Elst, Austria, N.Y. has been named the following vice president: **Kenneth D. Gengen**, corporate technical consultant; **Robert Z. Hagan**, chief engineer; **Ronald C. Koenig**, general manager.

**Paul W. Hiltner**, president, Clinton Corp., Los Angeles, Calif., a subsidiary of **Hughes** Corp. **Norman E. Presidents** Beck E. Lewis, resigns. **James B. Boller** is to manage business and engineering.

**Roger H. Blau**, managing partner, **Levinsky and Associates**, Va., succeeding **Markus Brown**, resigned.

**Paul M. Spalding**, assistant to the vice president and general manager of **Trans World Airlines**, Inc., resigns.

**Major Gen. Donald C. Dostie**, comander, **Space Air Development Center**, **AFB**, N.Y., replaces **Major Gen. D. F. Caud** managed as deputy comander of the same. **Air Force Communicaton** Command, **Scott AFB**, Ill.

### Honors and Elections

**H. M. Barnes**, chairman of United Air Craft Corp., has been elected chairman of the Board of Governors of the Aerospace Industries Assn. for 1965, and **David A. Knobell**, president of General Corp., is named vice chairman of the association. Elected to the Board of Directors of United **Robert E. Gross**, chairman of Lockheed Aircraft Corp., and **Donald W. Douglas**, Jr., president of Douglas Aircraft Co., Jr.

### Changes

**John A. Werring**, general service manager, **Avco Electronics Division, Yerkes, Inc.**, division of **Sperry Rand Corp.**, Denver, Colo., resigns.

**Les Brown**, assistant chief engineer, **United Aircraft Corp.'s Norden Division**, Norwalk, Conn.

**L. F. Yost, Jr.**, manager manufacturing, **General Electric Co.'s Light Military Electronics Division**, **Utica**, N.Y.

**James F. Rostek**, director marketing and planning, **General Dynamics**, The **Bechtel Corp.**, North Hollywood, Calif.

## INDUSTRY OBSERVER

► **Arpat** data, the reentrycraft that would be fired from the Arpat carrier vehicle to meet incoming ICBM warheads (AW 1/6, p. 28), are to be spherical or ellipsoid in shape and may weigh less than 90 lb. They will be equipped with special jets for velocity correction in addition to their boosters' boosters.

► **Navy** and **Coast Guard** each will receive two **Sequoia** 7 series radioisotope power generators, one producing 5 watts and another producing 35 watts. They will be used for such purposes as buoy, atmospheric weather station and navigation buoys.

► **Sister** 6 launch vehicle is currently scheduled to carry an \$ 18 payload identical to the S-15 microsatellite launch vehicle which failed to go into orbit. The test is not a backup but was planned as a repeat to capture microsatellite records. The S-16 is to be launched from Wallops Island Va., within three months.

► Only currently firm **Am Feste** VTOF requirement is **SCOR-187**, specifying a small anti-satellite aircraft to be carried by a C-130 class aircraft to a mother/daughter configuration (AW 1/6, p. 28). Development plan was due out of **Aeronautical Systems Division** at the end of June.

► **National Aeronautics and Space Administration** plan to build a static test facility at **Marshall Space Flight Center** for the **Rocketdyne F-200** 900-kilowatt liquid hydrogen liquid oxygen rocket engine. **Bechtel Corp.** has a \$12,000 design study contract to establish requirements for modification of the existing powerplant test stand to accommodate the F-200.

► **General Electric** is trying to make time between contracts for the **Cassini** B-58's JT40C-1A turbolifts to 1,000 hr. **General TBO** for the **General Electric** JTF4C-7 afterburning engine in the **Lodestar F-34C** and D models is 500 hr.

► **Av. Feste** is to take another look at its currently canceled mobile Minuteman missile program in August. This reevaluation was planned before the House Appropriations Committee expressed concern over the slowdown in the project.

► **West German** research firm is working under **Am Feste** contract on development of a lightweight point for aircraft that would shoot radar signals, destroying or blocking them from the receiver antenna.

► **Am Feste** has at least two advanced anti-ICBM research support projects under way—**644A** and **444D**.

► **Proposals** for the ultra high frequency communications system which is to link the semi-habited **Titan II** base site as do **Am Feste Ballistic Systems Division** **Div. 24**. **Boeing** probably will include **Melpar**, **Electronic Communications**, **Collins Radio**, **Hughes Aircraft** and a team of **General Dynamics**, **Electronics** and **Motorola**.

► **Aeropace Corp.** is preparing major solid propellant installations on **West Angeles** for producing smaller and cost for large boosters, as well as on their area of propellant interests, methods of production and test facilities.

► **Douglas** is preparing a second stage called **Dynasat**, using liquid hydrogen and liquid oxygen propellants for a space booster being proposed to **NASA** and the **Am Feste**. First stage would be a **Thor D-21** with three **Thiokol** 50,000-lb-thrust solid fuel boosters clustered around its base.

► **NASA** is testing three **Wind** pressure measurement devices for possible use in future Mercury capsule flights. **Wind** pressure was an important factor not measured during **Col. Alan Shepard's** MR-3 flight, but the agency hopes that a reliable source can be developed in time for the first manned orbital flight. **Wind** probably will be recorded and stored in the capsule rather than being telemetered in flight.

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## Washington Roundup

### NASA-Defense Study

Studies of the total national effort needed to provide facilities and support for the laser heating program have been launched under an agreement between National Aeronautics and Space Administrator James Webb and Defense Secretary Robert S. McNamara. NASA now has funds in the military areas for launching and tracking facilities, test stations and test and test support and review forces. The agency will require area since help for the laser effort.

Air Force studies began by Maj. Gen. Leighton J. Davis, commander of the Air Force Materiel Test Center, shortly after President Kennedy announced the laser program. Davis' cost and personnel requirements for the laser heating office, launching platform to measure neutron and damage products. One officer noted that this subcommittee plan amounts to "moving the Florida peninsula three miles west from Cape Canaveral."

After the agreement was reached, Defense ordered studies made from a department-wide point of view, to include all services and their logistics systems. NASA studies are expediting except in the internal economy.

Rep. Eddie Q. Davis, who has consistently favored use of NASA of existing military, has stressed instead that expansion of NASA's own life sciences program and last week, the agency is using the laser program as a vehicle to ask for a half-billion dollar space flight laboratory and increases of 100 people and \$12.5 million for life sciences research. He urged that the military's capabilities not be wasted.

Both the manned flight laboratory and NASA's Space Task Group, which is managing Mercury and probably will direct Apollo spacecraft development, are the victim of a political logjam. Rep. Albert Thomas' chairman of the appropriations subcommittee that passes on NASA's budget requests, has made no secret of his desire to have both funded in his Texas district. Meanwhile, Rep. Thomas N. Downing is seeking \$9,000,000 from his Virginia constituency, proposing transfer of STG from Langley Field. Despite Rep. Thomas' power, there are indications that his bill has lost the battle. But all NASA Administrator Webb will say is that no final plan has been approved.

Opposition is growing increasingly reluctant to consider the load of long-range authority his committee requires, that research efforts such as the Bionics space program require. Although the Johnson committee that complex technological projects cannot be successfully run on a year-to-year basis, thus far has no congressional control over government.

Rep. Jim Morris, now serving longer periods as well as the conservative who has long fought what they call "Sputnik spending," demands the hardline for public hearings on long-range Federal programs which the Senate Government Operations subcommittee under Chairman Robert Humphrey will hold July 16-19. Witnesses will include Defense Department Comptroller Charles J. Hitch and Dr. Harold Brown, director of defense research and engineering.

Cold's state-operated airline, Compagnie Coloniale de Aviation, may become the first commercial operator of Soviatsk aircraft in the western hemisphere. It began negotiations to buy replacements for Douglas DC-10 jetliners. The E-12 or E-14 twin-proton engine transports. Coldan also is considering a British Britannia cargo conversion that could load freight between Brussels and Prague or Moscow in a single stop. Hard pressed to purchase the planes, the airline is trying to sell three 80-seat Vickers Viscounts to France, the pachychev.

Russia's delegation is expected to arrive in Washington this week to begin negotiations on a U.S.-Soviet bilateral air agreement involving New York-Moscow service, including the controversial Soviet request for a route segment to Hawaii (AWW May 8 p 61).

If the political situation dictates, Soviet Russia and Communist East Germany have a tool ready with which to try to bar U.S. air traffic over West Berlin. A law in take effect on Aug. 1 will require all aircraft with radios to receive special permission from East German authorities to cross their borders. This traffic now is handled by a few radios on radio routes.

Russia has removed its photorecon flights of the Lockheed U-2. Two Soviet officers, working in the military journal Red Star, say the use of Alakchuk U-2s to check communications satellite equipment proves that "certain questions in the U.S. cannot tolerate the disgusting habit of looking through their neighbor's keyhole."

At the Atlantic Missile Range, where no one has been killed or severely injured in the launching of a missile in 11 years of operations, a 15 m. diameter 10 m. long silolet followed an裁裁 trajectory on July 4 and broke a window in the officers club. Seven persons were injured, two seriously enough to require hospitalization.

—Washington Staff

### Canaveral Calamity

# European Space Program Speedup Asked

Space scientists of 12 Western European nations ask for comprehensive space plans within a few months.

By Herbert J. Calenius

London—European space scientists, determined to emerge from the shadow of the world's two great space powers, are blinding their efforts to the development of a comprehensive program before the year's end.

Over all feeling at the European Symposium on Space Technology here was that the 12 Western European nations must formulate coherent space plans within a few months, or be content with minor projects of little scientific value.

Indicative of the European feelings toward establishment of programs separate from those of the U.S. and Russia was the unofficial backing of the British Blue Streak banner as a first stage booster, other than using U.S. or Soviet rockets, for the European Ariane or Charon-Sat.

But although more than 200 space firms were represented by the symposium, there was not a single active participant representing a European political area,

with the exception of a British member of Parliament, David Price (AW July 1, p. 31).

In general, delegates agreed with a statement by A. V. Cleaver, chief engineer, rocket propulsion, Rutherford Space Center: "The present time is critical. Unless we do get a program under way within months, we may never have one."

Cleaver was backed by G. K. C. Par-  
tton de de Haasland, who claimed that

the rest of all the treacherous delays and postponing is over, anyway.

Both men, of course, are deeply involved in development of Blue Streak, and they would both on and off the floor of the Congress would not be in danger of displaying U.S. space efforts and vehicles in the attempt to start a new program. One delegate put it to Cleaver: "Wait a little and we'll be up with a 12-stage booster, though not quite yet."

Cleaver replied that only through an organized program, using European resources and ideas, could the program go, although for the 12 nation consortium "there can be enormous." Par-  
tton added: "Using a European launcher is the means of getting our feet wet providing launching facilities is quite for our own use."

Germany has agreed to support Blue Streak (see box p. 13), Britain and France have agreed to use the rocket at a first stage with the French Vega rocket as the second and in a third stage an upper instrumented rocket. British Space Center, headed by Sir Robert Briscoe, has responded to the West German government that public money be used to develop a communications satellite, but an answer has not yet been received.

U.S. government stated well in the background during the London symposium that "we" (A. W. Finkin, NASA's director, office of international programs) who promoted cooperation in future programs would be that now undertaken by his office. At one point, in a discussion of development of an instrumented rocket, the U.S. had and was somewhat silent, as is not to precede the matter.

On 12 booster engines would be used at launch, and the F10s would be "available." Objective of the vehicle configuration would be to keep the number of stages to a minimum.

Marina's Apollo spacecraft, semi-bulletin configuration, would leave a mystery zone of 100,000 km, sufficient to return to Edwards AFB, Calif., from most orbital points.

Marina Co. was one of those who conducted Apollo feasibility studies for the National Aeronautics and Space Administration, which NASA is using to propose specifications for the Apollo vehicle system. Further conference will be held July 15-25, and the agency is expected to request proposals in September.

Topics headed by Constan Arribalzaga and Gérard Eclerc also made feasibility studies on the project.

Highlights of the Marina Apollo spacecraft proposal included a Europa weight would total about 140,000 lb, and the system would weigh 70,000 lb, while the basic landing instrument was 100 lb. Moon-land weight would be 21,000 lb, the return package would weigh 7,000 lb, and the earth-landing vehicle would weigh 9,500 lb.

A low-launch vehicle would be started from a 10-m, slot by starting azimuths 170 and ending them at intermediate Point Punkt & Whitney LR-113 engine would be used for low-launch.

Earth-blast transports have been computed to a reference of plus or minus one hour on one gross day using a polar escape route with compensation and heat shield for providing insulation protection. Systems being designed for 100 WEMH rate heat protection, and minimum expected in a solar flux is 100 RFP.

Guidance problem is one of the most severe with current planning directed toward a self-contained stored energy.

Translating the nominal low-launch mission can be accomplished in 1966 if all systems are developed simultaneously.

that 500 million people will be deprived of the future gains of space technology, thus retarding the entire field because, on construction, would never be used, the consequences would be disastrous.

It is not good enough to let the U.S. or USSR research vehicles. There can be no scientific contribution if we are, in other words, we must have a high degree of independence.

Writing against the much-debated issue on other pages, Cleaver and the Douglas Spacecraft in an example: "We must have the basis of life," he said. "The United Kingdom has chosen Space, as a weapon, much dependent on the U.S. for its supply. If the U.S. does not proceed with SLA, the United Kingdom is not independent with such large, multi-unit nuclear warheads as are contingent on agreement with that country, agreements which can be broken or are not worth it."

Another loss to Western Europe, Cleaver commented, would be management of satellites to the U.S. in search of international atmosphere. He said: "Early in the 1960s, the when Blue Streak was considered as a weapon, the U.S. declined options. Four members of the British committee to select the States on the grounds that such negotiations would favor the British tactical goal."

Par-  
tton later told the delegates: "Some of us have taken a step or two, others have yet to do so." With some reluctance pulling and pushing, the forward progress of all may be helped.

NASA, Par-  
tton said, will maintain

## Space Scientists

London—Today's space scientist must consider himself fortunate if he can allocate 10% of his time to pure research, according to Dr. Theodore Jon Koenig, U.S. scientist who was speaking chairman at the European Space Symposium here. He illustrated this point this way: "It took NASA seven years to get the Apollo program off the ground, and the Apollo program, in my view, is the best scientific program ever."

On the other hand, although it is set down in the charter that the U.S. has no scientific, technical, and financial interests in Blue Streak, both Rutherford and de Haasland have complicated liaison agreements as the launcher with Constan and Rutherford.

Question of synergism was ever present, in view of the vast scope and unique advantages by the U.S. and Russia. Said Cleaver: "If we in Western Europe have no program, the result is

that long deliberation, that once we believed that the only solution in the field was a United Europe. The experience and knowledge gained by the United Kingdom formed a large part of my extensive field of knowledge, and it would be our duty to support them and to present their ideas."

## Germans to Join Space Project

East-West German Parliament, in a major step toward making the revitalized European space program a reality, voted last week to pass the project, except as share of the financial burden and, more importantly, support use of a short-range booster system based upon Britain's de Haasland Blue Streak as the first stage.

Blue Streak with an advanced version of the French Vega rocket would be the second stage, has been pushed forward by Great Britain and France on both technical and political levels since early this year (AW July 13, p. 34), with the Germans regarded as a possible major participant. In some West German circles of late, efforts have supported adoption of an independent U.S. system, excluding revision of the Blue Streak. That is the low-Chlorine Wright System.

Third stage of the European booster system, will be provided by Germany, probably as a variant of Britain's Black Knight. Production of the booster units and their components may be shared by member nations with manufacturing capabilities equal to the task.

Later this fall adoption of a European space program around the Blue Streak/Wright Black Knight launcher configuration was made by the director of the United Kingdom Atomic Energy Authority Research and Development Division at the European Symposium on Space Technology in London (AW July 7, p. 30).

In approving the plan, the West German Parliament also agreed to the proposed economic financing plan for the European program in which Germany would shoulder approximately 10% of the costs. East Berlin, with 30%, would carry the greatest burden followed by France at 20%. The remainder would be shared by other European nations, joining in the program. As outlined at the London symposium, total cost of such a program over a 10-year period would be about \$140 million a year.

a broad program of cooperation in space with the Western nations.

Par-  
tton's statement may have been because a single British space organization, the European Space Agency, was recently established, which puts all government and entrepreneurial efforts in terms of human health and national frontiers—but not private dividends.

In annual programs, Par-  
tton lists British scientists and engineers, including as being of particular commercial significance. Navigation satellites are another aspect. European nations should explore but, probably, not, by themselves, because Europe may be highly selective in its future programs.

Arid from the fact that Europe could not manage to have the U.S. launch a scientific satellite on which both Par-  
tton and Dr. Werner Arnett, the European space program director, are working, "we are not very interested in the long range, on the scientific side," he said. "The short range is, on the scientific side, we go bankrupt." That is, and, at the end of the discussion, Par-  
tton's summary.

French space scientist and Dr. Pierre Vautier, of SFRB (Société d'Etude d'Etat de Recherche d'Engins Développés), who said Par-  
tton supports Blue Streak as the basis of a European launcher but "not" pretending that this is the only suitable technology in current overall possible.

"What we did was and repeat with conviction, was that once we believed that the only solution in the field was a United Europe. The experience and knowledge gained by the United Kingdom formed a large part of my extensive field of knowledge, and it would be our duty to support them and to present their ideas."

Deputation of efforts with the U.S.,

in Vautier's view, "would be stupid, and Western nations should collaborate."

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tton's statement may have been because a single British space organization, the European Space Agency, was recently established, which puts all government and entrepreneurial efforts in terms of human health and national frontiers—but not private dividends.

David Price, an economist besides being a member of the British Parliament, intended that the major dimension of political side of space research is in eventual economic benefits. Because it is responsible at present to put a price figure on, for instance, financial return from a communists been possible, "space research is unlikely at present to appeal to the Prime Minister of our country," he said.

Price said he believed major benefit to be relinquishing, "as the long run," but noted that "shorter,". Maynard Keynes was not very interested in the long range, on the scientific side, we go bankrupt." That is, and, at the end of the discussion, Par-  
tton's summary.

A joint association test conclusion, set of research opportunities to space research was proposed by Horstiss Fassl of Düsseldorf, Westphalian Overhead office of West German Post, called for establishment of a European intercontinental nodal network for research conducted with that at White Sands, Tschad, Pisa, Rio, Göttingen, and F. C. Chambéry, P. M. Maga, Williams Island, Cape Canaveral and Eight AFB.

Initial study in Europe would probe sounding high and low pressure areas in the upper stratosphere and patterns of warming discussed in the lower stratosphere with high altitude hot

## Two-Stage Apollo Launch Vehicle Proposed

Two-stage launch vehicle consisting of Rutherford F1 and 12 engine boosters is being proposed by Martin Co. to boost the Apollo payload on its least landing and return mission.

George S. Trabek, Jr., vice president for advanced programs, and that although Martin has concentrated on the Apollo spacecraft, the company proposes a booster stage of four F1 engines connected by eight J10s, which would provide a 500-km thrust of 7.8 million lb. Beyond stage would be eight F1s, with a series of 100-km thrust boosters. Versions could provide two mid-course thrust corrections of 100 km each.

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Translating the nominal low-launch mission can be accomplished in 1966 if all systems are developed simultaneously.

# NASA Review Supports Atlas Despite Space Launch Failures

Washington—Final review by the National Aeronautics and Space Administration indicates that despite its failures, there is nothing basically wrong with the Atlas in a space launch vehicle.

The Atlas, the key to successful manned orbital flight in Project Mercury, has been under a cloud because of failures in the space program (AW Jan 23, p. 18). In 12 space missions using Atlas boosters, four have been successful, one partially successful, and seven have failed. Upper stages and components, either than the Atlas system, account for some of the failures where the cause has been determined.

As a result of these failures, an all-NASA panel recently made a technical survey of the Atlas in the areas of structure, loads, materials and dynamics and concluded that the agency can choose among three alternatives to future use of the vehicle:

- Strengthen the entire structure during production, making the vehicle heavier.
- Limit missions to options after dynamics, and launch at optimum times with a standard vehicle.
- Fly ahead of specific vehicles to launch specific payloads, conduct integrated vehicle/payload dynamics analyses, and "pushes-holds" vehicles to the limit from the last alternative.

At the first two would involve prolonged and massive redesigns.

The implementation that follows plan would be the best alternative from the Agency's point of view. Of four Mercury flights, one was successful, two failed and one is considered a partial success. The three Atlas missions failed, and of four Atlases, two Success and two Mafias, launches early in space increase the success success to Project Success. These have been 87 complete successes in 42 developmental flights of the Atlas D at a missile system.

NASA has ordered special modification of the Atlas D for Mercury and is considering ordering them for orbiting astronomical observatories, IR/NGH peripheral load, and the Atlas will make available to the community a standard platform having load to strengthen the upper structure (AW Jan 16, p. 27).

The extra-thick GMA will be launched in a lengthened Atlas Agena B, and a spatial timing will provide stability for the payload.

NASA is not considering changing boosters for Mercury because an change now would cause a serious delay in the 30-month plan because the agency is committed the Atlas is able to perform the Mercury mission.

Lockheed-Atlas (LMA) should

Aug. 25 failed because of an abnormal shutdown in the programmed George M. Low, NASA manned space flight, said all indications point to a "good fit" and a modified program has been under test for two months.

ML-3 was detected by the range safety office when it failed to pitch over and the programmers found board at the end of the capsule (AW Aug. 19, p. 25). Only Mercury flight one was successful, two failed and one is considered a partial success. The three Atlas missions failed, and of four Atlases, two Success and two Mafias, launches early in space increase the success success to Project Success. These have been 87 complete successes in 42 developmental flights of the Atlas D at a missile system.

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be considered a "no-fail" option because the agency is evidently going ahead with the mission. I think we should be doing a "National Reassurance" to the Nation that.

Commenting on the "no-fail" option, Col. George White, who directed July 1 panel, said that the Russians have a 65 to 85% heavy launcher. "The Russians are evidently going ahead with their launcher. I think we should be doing a "National Reassurance" to the Nation that.

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In a related development, the Joint Congressional Atomic Energy Committee, in its report on the Atomic Energy Commission authorization bill displayed "the apparent lack" of technical information on the Soviet Nuclear Program. (AWP) AIAI, a group available to Defense Department officials when they decided to cancel it.

The joint committee said "classified information" was responsible for technical progress in ANP. For the last two years was "exceptionally gratifying" and its approach will be carried along to permit design and construction of a ballistic nuclear engine for ground tests.

A number of committee members were disappointed in the cancellation of the project," the report said. "Their primary concern expressed was the apparent lack of information on the technical status of the work to those in the executive branch who supplied the information upon which the decision to cancel the project was based."

## Air Force Reorganizes Deputy Chiefs of Staff

Washington—Offices of two Air Force deputy chiefs of staff have been reorganized in connection with the July 1 deadline for completing changes in the new Air Force Systems Command, Logistics Command and Office of Air Materiel Supply.

Lt. Gen. Mark E. Baudler, formerly deputy chief of staff for materiel, has become deputy chief of staff for logistics and logistics (AW Aug. 10, p. 25). He is assistant for logistics to Maj. Gen. W. L. Kline, D. Scott, the assistant for logistics to Maj. Gen. B. E. Holbrook and the director of strategic resupplies to Maj. Gen. M. D. Adams.

Gen. Baudler's new office combines responsibilities of development procurement, logistics resupplies of aerial, naval and space programs. The new office will be authority over some of space advanced technology studies, procurement and development planning.

Deputy chief of staff for research and technology is Lt. Gen. Robert T. Wilson, who was deputy chief of staff development. His assistant is Maj. Gen. Victor R. Hargan.

Director of Advanced Technology under Gen. Wilson is Maj. Gen. Mervin C. Denner, Director of research is Brig. Gen. Ralph L. Wood, and Director of development is Maj. Gen. William B. Koenig.

The office is responsible for long-range plans, policies and objectives of Air Force research, and it will research and support advanced programs as the focal point in the Air Force for science and technology.

Although the director of materiel acquisition has responsibilities for staff functions of development, production and production review for most projects, the Materiel, R&D, and STO director will have their own separate director reporting directly to Gen. Holbrook.

These special offices will exist during the initial period in a project's cycle.

## Scout Launch Fails With S-55 Satellite

Washington—Attempts to place the two-experiment S-55 microsatellite into orbit failed July 14, 30 when the third stage of the four-stage Scout launch vehicle exploded.

The launch from Vandenberg AFB, Calif., was the first of 10 planned Scout development flights. The satellite was successfully inserted into low Earth orbit, but two instruments did not function.



## New Soviet Mach 2-Plus Fighter

New supersonic Soviet long-range interceptors armed with air-to-air missiles have been seen by Western observers in the eastern skies over the Tuva region in Siberia. This development is believed to be a "Mikoyan design developed from the earlier 'Fulcrum' (F-117) but having a larger wingspan and a larger vertical stabilizer. The earlier aircraft design first flew in 1976. The new fighter is about 30 ft long, has a single large air intake with a conical diffuser that looks similar to the MiG-21. It appears to have three engine nozzles at the tail of which one is in line with the third air intake located under the fuselage. Six to eight radars appear to be external挂载, similar to the MiG-21 Fulcrum. This new design is believed to be the second Soviet plane designated the "MiG-2" in clashing world speed and altitude records for a flight of 1,151 mph and 112,204 ft. Large amounts of fuel are carried in the wings. These Fulcrums also carry nuclear weapons. These Fulcrums also carry nuclear weapons.

Fig. 16 is its only successful orbital mission to date.

The S-5 package, which would have included Lockheed X-37 if it had been successful, consisted of three experiments:

- Prepositioned self defense systems, designed in National Aeronautics and Space Administration's Langley Research Center consisting of 100 half cylinders mounted in five rows around the fourth stage. The cells, powered with nitrogen, will detect incoming orbital particles to prevent loss.

- Two gap detectors designed in NASA's Lewis Research Center, consisting of 100 solar panels mounted under 50 solar array cells. Measurements determine the start of the fourth stage, which had two fuel tanks, were to be recorded.

- Gap sensors, essentially 96 copper wires, strung around an enclosure made in an experiment designed by NASA's Goddard Space Flight Center. With

## Atlas E Flight Test Program Reviewed

Washington—Special review committee last week began a review of the USAF-Causeway II flight testing program, which said that fine had experienced seven failures in its first 14 launches. An 11th launch attempt was scheduled for later this week.

The committee, headed by Dr. Clark Miller, professor of aerodynamics of Caltech Institute of Technology, is being to determine:

- Whether the E model, which incorporates changes in the engine, exhaust and guidance systems compared with the D model, can still meet an original research and development objectives.
- If it is, whether it is preferable to stay with the original test series schedule and accept few data or to change the schedule enough to obtain all the data desired.

Committee members include: Tassos Gavrilides, president of board chairman of Hycon Management Co., and Dr. Fred C. Luetkemeyer, director of flight dynamics at Lockheed, and Dr. Alexander T. Sauer, president of the National Research Council's Space Technology Division.

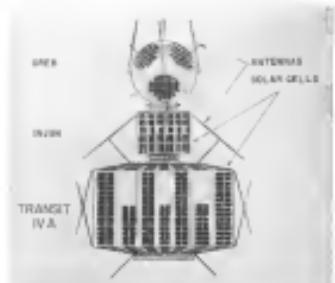
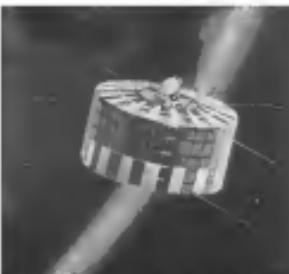
The committee was to visit Causeway's Atlas plant at San Diego, AFSC's Defense Systems Division, Aerospace Headquarters at El Segundo, and Space Technology Laboratories, Inc.

None of the first 10 Atlas E launch attempts were made from the Air Force Missile Test Center in Florida and one was an attempt to launch from the coffee type of operational installation at Vandenberg AFB, Calif. But two attempts was to be made from Florida.

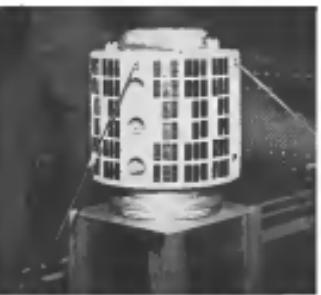
No failure of fuel had developed at the first 10 launch attempts. The hydrazine system was blamed for the first two failures, but this was corrected and the hydrazine system performed properly at later times.



ARTIST'S DRAWING shows left to right Able Star upper stage, Transit IV-A, Iapsi and Corb. White sphere on top of Transit (right) is a radioisotope-powered Snap generator. Photo below shows their Able Star singlet in the one which made the orbital launch



TRANSIT IV-A and its two payload satellites, Iapsi and Corb, are depicted (left) as modeled in one view. Closeup of Iapsi is shown at right. Iapsi is designed to be stabilized by magnetic attitude control to keep it properly oriented.



## Transit, Two

By Larry Books

Washington—Navy's Transit IV-A navigation satellite, carrying an atomic surface power unit, is operating in orbit, and two smaller satellites launched with it are providing information on atomic radiation and related phenomena. The design is that the Iapsi and Corb III payload research satellites will be separated from each other (AW July 3, p. 35).

The Transit package, now "working perfectly" a few days after launch, Navy said, has glow phenomena which would have been purged by the photovoltaic module in the Iapsi. Iapsi will not be possible because the solar is enough power to be the 35-lb. Corb satellite.

### Project Menace

In the first and second phases after launch, Project Menace researchers and Navy Navy's missile division reported three objects. These should have been four—the three satellites and the test stage. On the next day, scientists confirmed the failure of the two smaller satellites to separate.

Transit instruments on 98 and 130 megahertz indicated that the radioisotope power source was generating heat and the solar cells generating two after instruments were functioning properly.

Meanwhile, the Administration had decided to allow the power unit to be placed in Transit for a launch even scheduled for June 6, but rescheduled in mid-May and postponed it to be carried on June 28 (AW July 3, p. 25).

The nuclear power device contains



## Small Satellites Work Despite Malfunction

5 in. in diameter in one direction and 5.5 in. long. It weighs 4.5 lb. and is fueled with plutonium-238. It is based on the previously demonstrated Transit 5 unit, which was powered with plutonium-239, and is more powerful.

A comparison with conventional power sources can be made with the Snap 5 unit, which can produce the power equivalent of 1,700 lb. of natural-cadmium batteries and solar cells in 360 days.

The generator is contained in a rugged cylindrical package of aluminum intended for high-altitude reentry and heat from atmospheric drag. It was the safety testing program of the Atlantic Young Contractors which helped bring the plutonium option in favor of space launches for the de- vices.

Spontaneous decay of the radioactive plutonium-238 generates heat, which, in the block surrounding it, causes thermocouples which convert it to electrical energy. The unit produces three units of power. At each device produce 100 voltages and high current.

Transit instruments on 98 and 130 megahertz, for example, can last half as long as 30 yr., making it thermodynamically capable of producing power for decades. However, on the Transit instruments the goal is 5 yr. or more. Cost of the generator without the heat is \$4,900. AEC has applied the radioisotope generator principle to powering remote weather instruments (see box p. 28).

The Transit power unit was developed by the Mound Co. for AEC and the heat source was funded by AEC's Mound Laboratory at Miamisburg,

Ohio, which is operated by the Man- ufacturing Chemists Laboratories.

AEC officials grant considerable time in a given contract, expending the fifth angle of Snap-type power units, calling the capsule "virtually irretrievable." AEC Chairman Glenn Seaborg said he would have no fear of losing the power unit's heat element. He compared the amount of radiation emitted by the plutonium-238 in one hour to the amount emitted during a dental X-ray. Radiotracers were to be used to change the plutonium target in the heat source in order for the radioactive elements to reach the bones where they can do damage to the blood-producing marrow.

Operational satellites will be smaller in size and will be placed in polar orbits from the Pacific Missile Range's new facility at Pt. Arguello, Calif. Four operational satellites will initially be operating in orbit.

At a hypothesis of the mercury readout system of the latest Transit (AW July 27, p. 34), a new and easier approach has been decided will be made available.



SNAP GENERATOR is fastened to base of the latest Transit satellite prior to vibration tests.



### GE Plug Nozzle Rocket Modup Unveiled

Closed Electric Ge's plug nozzle rocket modup, expanded to a 2.5-milliliter thrust rating, is shown in the engineers' modup. Overall height of engine is 15 in., diameter is 15 in. Turbopump and nozzle equipment would be joined as initial orbital engine test, and base of the propellant tankage would attach directly at the top of the nose cone structure in any application. Plug nozzle would have 13 segments.

able over the surface of the earth. Current time standards are available to radio transmitters from radio stations as WWDV of the National Bureau of Standards. Such transmitters are subject to variations in reception because of the fluctuations of the atmosphere which reflects the signals back to earth.

Absolute time standards, accurate to several milliseconds, are needed in more applications. Microscopic atomic pulsations in the atomic nucleus provide a highly dependent on the environment time standard.

Transit X-1A carries a magnetic electron source. It is being fed orbital data every 12 hr to ground stations. Data is 11.1 kb/s, at 4.01 bauds, via precise pointing over the surface of the earth.

### Frequency Divider

These instruments will be triggered by a bipolar diode consisting of 25 transistored circuits controlled by a highly stable, 3,000 kilohertz crystal oscillator. The timing of pulses of the bistable will be more accurate than the most of standard time birefracts discussed above.

Estimating the navigation information provided by Transit will be available in varying degrees of accuracy, depending on the degree of sophistication of the navigation equipment. The most likely design would be a receiver and doppler analyzer from which data

- satellite. However, photons will be removed from ground stations
- Study of the oxygen gain law and its connection with auroral phenomena
- Study of both particle and light fluxes associated with aurora

Japan is designed to be stabilized by magnetic attitude control, as in the Transit modup, to keep it oriented so its induction coils will be positioned correctly with respect to the earth. Japan's most remote shaped the field of the earth's magnetic field so it will change its position with respect to the sun and escape its solar cells. At altitude modup is operating slower than intended because the two radios are together.

Both Japan and Transit were subject to magnetic measurement test at the Naval Ordnance Laboratory, White Oak, Md.

### Ge's Satellite

The Ge III, also called Naval Research Laboratory's Solar Radiation III satellite, is designed to measure the rate of X-ray radiation from the sun. During solar flares, great quantities of X-rays are emitted causing damage to the atmosphere and consequently affecting radio communications.

Data from this satellite are expected to shed light on the relationship between sunspot activity, solar X-ray emission and radio wave propagation on earth.

Ge III, unlike its two predecessors, which contained one ultraviolet detector and one X-ray sensor, carries two X-ray sensors. It has been discovered that ultraviolet emissions remain constant during solar flares. Thus two X-ray sensors will be able to cover a greater range of the spectrum.

Ge III is designed for a 1-year life. Because it is fastened to Japan, it is rotating slower than intended, and is transmitting about half as much data as planned.

### Atomic Weather Station

Washington—Atomic powered earth weather station, first of its kind has been developed from a Martin Co site as illustrated to the Atomic Energy Commission's directorate offices here. The test station is powered from the beta particle emission of strontium-90 which has a half-life of 25 yr.

The station designed for about two years of sustained operation at remote locations is 8 ft. long and 20 in. in diameter. It contains two atomic power sources, two wind direction and velocity sensors, and a radio transmitter and receiver.

• Measurement of charged particles trapped in both the inner and outer Van Allen belts

- Measurement of particle density from the equator to the polar zones and observation of ion flows and auroral emissions. This is the pattern of the observations affected by having the photometer covered by the Ge III

## Disarmament Research Effort Proposed

Washington—U.S. Department Agency for World Peace and Security, proposed to Congress by President Kennedy, would undertake a vastly upgraded program of research and development in weapons detection and monitoring technology.

To accomplish the program, the \$27,500-a-year presidentially proposed division of the agency would be expanded and to coordinate the services of other executive agencies, including Defense Department, Atomic Energy Commission and the FBI, to reconstruct new facilities and laboratories "to do more accurate," and to let contracts and make grants in private institutions.

### Specific Projects

The projects specified in the proposed legislation for the new agency, ranging from studies to the practical development of arms control devices and methods include:

- Detection, identification, inspection, monitoring, limitation, reduction, control and elimination of armed forces and armaments, involving intercontinental, mobile, conventional, bacteriological, chemical and technological weapons

- Techniques and systems of detecting, identifying, inspecting and evaluating of lots of nuclear, thermonuclear and other weapons

- Control, reduction and elimination of armed forces and armaments in space, on land and beneath the earth's surface, and in underwater regions

- Training of scientists, technicians and other personnel for running the control systems which will be created by international disarmament agreements

- Reduction and elimination of the size of the armed forces and armaments of the United States and of other countries, in the methods of economic, social, political, military and technological areas, upon which nuclear disarmament plans must be based

- Studies for general freedom

- Conduct, support and coordination of research for disarmament policies, functions

- Preparation for and direction of U.S. participation in international negotiations in the disarmament field

- Dissemination and coordination of public information concerning disarmament

- Preparation for, operation of, in an appropriate duration of U.S. participation in such control systems as may become part of U.S. disarmament activities

John J. McCloy, "consulted closely" with Senators at State Dorn, Rankin, Senator of Defense Robert S. McNamara, and AEC Chairman Glenn T. Seaborg, noted that an effective disarmament program will require that "close and continuing" cooperation and competition be established" between the new agency and State, Defense and AEC.

The legislation authorizes the hiring of military personnel to the agency without regard to race, color or alienage in the service. It also provides that there will be no effect "which we expect as military strategy or weapons research" may be employed by the agency without loss of permanent personnel.

The agency would also undertake extensive programs aimed at economic and psychological adjustment to disarmament—home and abroad.

Projects specified are:

- Analysis of national budgets, levels of industrial production and economic indicators to determine the amount spent by various countries for armament.
- Economic and political consequences of disarmament, including the potential of disarmament among industry and the effect on national armaments.
- Disarmament implications of foreign and national security policies of the U.S. with a view to better understanding of the significance of such policies for the achievement of disarmament.
- Techniques and systems of detecting, identifying, inspecting and evaluating of lots of nuclear, thermonuclear and other weapons
- Control, reduction and elimination of armed forces and armaments in space, on land and beneath the earth's surface, and in underwater regions
- Training of scientists, technicians and other personnel for running the control systems which will be created by international disarmament agreements
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- Dissemination and coordination of public information concerning disarmament
- Preparation for, operation of, in an appropriate duration of U.S. participation in such control systems as may become part of U.S. disarmament activities

## Pratt & Whitney Wins Test Facility Contract

Washington—Pratt & Whitney Co, aircraft, Avco and Nuclear Engine Laboratory has been awarded a \$500,000 contract to design and build a test stand for ion and nuclear power heat radiators at Lewis Research Center.

The National Aeronautics and Space Administration facility, to be completed in 15 months, will include an ionization test series 18 ft. long and 5 ft. in diameter. Closed loop working test sections will be capable of radiating heat loads up to 1,000°F.

# Third Tiros Test Flight Scheduled To Cover 1961 Hurricane Season

Washington—Third satellite to be launched this week from the Atlantic Missile Range by a Delta vehicle, with an operating lifetime designed to coincide with the 1961 hurricane season.

Instrumentation in the 285 lb. package is similar to that in previous Tiros satellites, with improved weather parameters for electron equipment and newly-designed, improved circuits in which trigger the circuits.

Tiros III will have two wide-angle television cameras covering about 750 sq. mi. of the earth's surface at a resolution of 1/2-1 mi. Resolution and picture quality are to be improved, Tiros III has been eliminated, according to the National Aeronautics and Space Administration, bearing down from the wide-angle cameras has proven more valuable for weather analysis.

The television cameras have a line speed of 10.5 with a shorter speed of 1.5 interlaced. Video bandwidth is 62.5 kc.

Each camera can record and store on 480 ft. of video tape 32 photographs during each 90-min. orbit. The total tape is to be launched onto a 400-cc oxygen bottle. The package is covered by 9,266 sq. in. of film which will provide enough to fit most cameras though batteries.

In addition to the camera system, instruments on Tiros III are:

- Three infrared experiments, one a scanning device containing six sensors and two non-sensors. The scanning system will map reflected solar radiation, long wave infrared from the earth and atmosphere, cloud top temperatures, and atmosphere level (25-600 H<sub>2</sub> temperature). Both non-scanning sensors will measure gross heat budget and automatically and the others on command.

- Electron sensor, also an infrared device mounted on the satellite, can which determines the satellite attitude.
- North indicator, consisting of a series of solar cells which relay data on the position of the satellite in relation to the sun.

- Magnetic orientation control, a van coil around the lower portion of the satellite which generates a magnetic field to tilt the package on ground command.

Priming ground command and data modulator stations are at Wallops Island, Va. (AW, June 5, p. 25) and the Pacific Missile Range. Backup stations are at the Atlantic Missile Range and the Radio Corp. of America's Princeton, N. J., facility.

Priming ground command and data modulator stations are at Wallops Island, Va. (AW, June 5, p. 25) and the Pacific Missile Range. Backup stations are at the Atlantic Missile Range and the Radio Corp. of America's Princeton, N. J., facility.

the executive committee. Gofford K. Johnson, president, Curtis Shaver, executive vice president, Robert E. Blyden, vice president, technical director, Leo D. Wilson, vice president, marketing and treasurer and James J. Keeley, vice president, controller.

New headquarters will be established at Dallas Grand Prairie, where Chance Vought and Tencor's main production facilities are located, but former Long Tencor executives pointed out that although they are moving from their former Garland offices, the program called for continued building of that plant's engineering and production. Work will continue in extensive environmental and other testing laboratories at Garland. Commercial products production, as in the company's new division, is being expanded and electronic products work there is also reported to increase.

Former offices of Long Tencor and Chance Vought into Long Tencor Inc. will be followed by separating the former two companies' facilities and subsidiary organizations into seven new corporate groups (AW, Apr. 3, p. 29).

Although officials of Long Tencor-Vought declined to discuss specific marketing of the new companies, indications are that it will take the mode:

- Atmospheric Systems, consisting of Chance Vought Corp., which will be a sub-division of LTV with current Vought's former Atmospheric and Meteorology Division, Atmospheric Division, Remote Systems Division and Electro-Physics Group.

- Electronics Group, called the LTV Electronics Division, will consist of Tencor Electronics Division, Vought Electronics, Microelectronics Components Division and United Electronics.

- Communications and Test Systems Group which probably will be tagged the LTV Communications and Test Systems Division will comprise Communications Division, Manufacturing Co., Long Electronics, the California Co. and Electron Corp.

- Commercial and Industrial Products Group probably will consist of Tencor Industrial Division, Products Refrigentation and Vought Industries Inc.

- Sound Systems Group will include Alex Loring Corp., Alter Service Co., Perthes Electrical Products Division, Vacuum Laboratories Inc. and Com-Relief Cabinet Corp.

- Aeronautics Group, will have Tencor Overhead and Aeronautics.

- LTV Information Handling Systems Group will comprise Information Systems Inc. and National Data Processing Corp., also a Vought subsidiary.

Management of Long Tencor-Vought Inc., will consist of Robert McClelland chairman of the board and chief executive officer; James J. Long, chairman of



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## Seventh Army Gets First Mohawk; STOL Aircraft Tours Europe

**G**eneral-Saint-Gobain Mohawk helicopter manufacturers aircraft has been delivered to the U.S. Army in Europe as a prelude to scheduled deliveries to operational units this fall.

Delivery of the aircraft to the U.S. 7th Army at Standheide Air Base near Mainz-Hochst, Germany, by Captain Chief Test Pilot Ralph Daniel followed an extensive European tour in which the Mohawk's STOL capabilities were demonstrated to American personnel and to European military officials. And a tour of planned routes with U.S. and German troops in the Rhineland-Palatinate, the Moselle and the West Eifel regions, as well as with its manufacturer's production agreement with France's L'Orée-Breguet (AW May 19, p. 26).

The agreement, however, is broad enough in scope so that Germany could offer licensed production to firms of other European nations if orders from their respective countries lagged upon such an agreement. Breguet's earlier agreement with General-Saint-Gobain gave the latter production rights to the Atlantic turboprop anti-submarine aircraft if it should be ordered in quantity by the U.S. Navy is equally broad since the American government would have the final say as to whom the American anti-submersible would be.

General-Saint-Gobain's first Mohawk to Europe probably will show its capabilities at the recent Paris Air Show attended by defense officials from a number of countries. Appointed a total of 29 air fields, including Le Bourget, in establishment before delivery to the 7th Army.

Aside from its anti-submarine capability, German army interest focused around the Mohawk's capability as a weapons carrier, a role denied it under current Defense Department restrictions on U.S. Army roles and missions. When being evaluated by the Marines, however, the aircraft was fitted to carry an external weapons load, thereby exceeding the weight limit of 7,740 lb. And from photographic reconnaissance, the Mohawk also can be used for infrared detection missions and, through the installation of an electronic sensor mounted beneath the fuselage, for roles requiring the use of side-looking radar.

In the event of war, European production, Grunmann is considering substitution of the present two 1,085-hp Lycoming T53-L engines with two de Havilland Centaurus of 1,130 shp each adapted to helicopter configuration. The company also is suggesting to per-

mit customers the 1,130-shp T-variant of the T53 scheduled to become available sometime next year. The T53-L engine would boast maximum weight of the aircraft from 10,000 lb to slightly above 10,000 lb.

During its European tour, the Mohawk operated from airfield locations within five and one-half miles of the East German border, according to Grunmann officials and, in two other occasions, from bases within 10 miles of the border. The standard performance was to land a low altitude, angle-on pass with a turn and roll into the dead engine.

### Proposals Submitted For Lift-Fan Vehicle

**N**ew York-U.S. Army is expected to soon announce its choice of aerospace manufacturers to develop a test vehicle for General Electric Co's lift-fan concept.

See *Aerospace* p. 36. Bell, Convair, North American, Northrop, Rockwell and Sikorsky have submitted proposals. Observers understand that not everyone will be on equal footing in the final choice.

Development cell for a maximum speed of 410 kt and maximum altitude of 40,000 ft is to be provided for 20 to 30 days. Instrumented flight capability, spelled out in the specification as a full flight control capability under U.S. rules, is expected.

Performance levels of the fan required to meet specifications have been down-estimated earlier by General Electric in a test program. Flight vehicle will be used to investigate speeds in excess of both VTOL and STOL modes.

### News Digest

**R**otolux European Aircraft is considering purchase of three Bellanca VZT-107 helicopters for cross-hatched terrain navigation. London with Robert Yerger, president of British Vertol, would be interested in Rotolux providing a Rotolux production division.

In the event of war, European production, Grunmann is considering substitution of the present two 1,085-hp Lycoming T53-L engines with two de Havilland Centaurus of 1,130 shp each adapted to helicopter configuration. The company also is suggesting to per-

mit customers the 1,130-shp T-variant of the T53 scheduled to become available sometime next year. The T53-L engine would boast maximum weight of the aircraft from 10,000 lb to slightly above 10,000 lb.

The Bell Aerospace Board has voted its order giving a blanket exemption to Saturn Avionics to operate its mobile aircraft production centers without prior Board approval while it continues pursuit of Polar Avionics' World Avionics and Trans World Airlines.

**B**oeing Co has received a \$160,000 National Aerospace and Space Administration contract to study design problems of large solid rocket launch vehicles (AW June 26, p. 26). NASA will use the information in writing specifications for the solid boost to be developed by the Air Force to meet NASA requirements.

**M**ilitary Air Transport Service has awarded on fixed 1962 contracts for L-101 and Cessna commercial aircraft to replace old piston aircraft rates specified by Civil Aviation Board (AW June 12, p. 37). However, MATS reports that if after 90 days Cessna fails to meet the new rates, rates must be continued. The dollar volume of the fixed 1962 contracts will be determined pending a review for more money.

**I**nterair's three-stage solid rocket containing a solid core payload to 10 miles altitude last week in a suborbital flight experiment designed to measure wind speeds in the upper atmosphere. Solid and liquid rocketry in the upper atmosphere using Nike-Acup and Nike-Cajun rockets.

**C**ivil Aviation Board regulations going into effect July 1 after the Senate rejected Government Operations Committee action and approved it (AW, July 3, p. 36).

**A**legheny Airlines and National Car Rental System have signed an agreement under which the carrier will require a 10% interest in National. National, which concentrates its activities in the west and south, will expand its operation to include cities served by Allegheny National, seven 707 U.S. 737s and operates 12,000 cars.



# Independents' Route Applications May Affect Trident Jet Orders

London-British European Airways, the state-owned airline, last week said that 35 of 42 Hawker Trident jet transports now in service would become surplus if parallel routes were granted to the independent carriers.

From 1966, independent airways to 72 route applications before the Air Transport Licensing Board. BEA also argued that granting the routes would limit service separations in bilateral regions because of new or increasing protection of and restrictive policies of European governments.

Spokesmen told the board that the Trident order was based on traffic projections to 1986 and that the diversion of traffic from BEA to the independents would make most of the applications redundant.

Reference to the aircraft orders, although expected, pose a problem for the Licensing Board because British United Airways, also granted 111 route applications to Central Eagle Airways, a \$25-million subsidiary and joint to build a new Queen service here.

The board was attacked by the Labor opposition as in effect a subsidy to allies. Central Eagle to buy two U.S. jets Boeing 707-320s in complete with stand-on BOAC.

In testimony before the board, Peter W. Brack, BEA fuel planning manager, said that even if all Tridents were retained in the program, a large number of older aircraft would have

to be disposed of at a cost disadvantage. In defense of BEA's pooling arrangement, airline officials said, in the original terms (AMW June 26 p. 48), BEA's fuel management system changed the independent operators' cost base so that they generated more traffic than would be normally allowed under bilateral agreements.

He denied that pool eliminated competition, adding that "in effect we're in such agreement to retain its competitive position." He predicted that if pool agreements were canceled, the result would be higher fares.

In another development involving independent carriers, the British Parliament passed the North Atlantic Shipping Bill last week. It contains a provision for Central Eagle Airways, a \$25-million subsidiary and joint to build a new Queen service here.

The bill was attacked by the Labor opposition as in effect a subsidy to allies. Central Eagle to buy two U.S. jets Boeing 707-320s in complete with stand-on BOAC.

**FAA Assumes Control Over Tall Structures**

Washington—Federal Aviation Agency will assume licensing control over tall structures that a previous agency had built in the U.S. despite objections from the Federal Aviation Commission.

FAA's new regulations, effective July 15, will require persons interested in erecting certain structures to give the agency at least 30 days' notice. In general, structures more than 150 ft. high that extend outward from an airport's approach plane or are within 500 ft. of an air carrier will fall in this category (AMW Sept. 26 p. 40).

The new Part 625 of the Civil Air Regulations also contains an unusual tall structure which will enable builders to determine whether a planned structure might be taller than a permitted height. For example, structures with a height of 500 ft. or structures with a height of 120 ft. but have a central tower or certain parts of a tall structure, certain criteria are considered to qualify.

FAA has solicited this issue of a new procedure because we are about to proceed with a series of tall structures and significance without an appropriately detailed application by the carrier seeking operating authority," the Board will

first proposed Sept. 16, the rule date arrives from FDCG, which also noted that radio and television antennas should not be the subject of final FAA control.

But the rule as adopted will effectively require builders of broadcast towers to obtain permits from both FCC and FAA. At the same time, the new Part 625 provides for "interim" form which broadcast towers can be permitted to minimize their impact into navigable airspace.

FAA's rule does not apply to structures already in existence. Allocation of these structures, however, went west to the new criteria. To handle individual cases, an exception might be allowed for the rule to have a provision for holding fast-frozen hearings.

## Peruvian Line Charges Violation by Panagra

Washington—Airlines Peruanas, Peruvian state-owned airline, has charged Panagra with violating the bilateral agreement between the U.S. and Peru and has asked the Civil Aviation Board to investigate.

The airline told the CAB last week that Panagra has been offering services in "gross violation of the terms" including the U.S.-Peru agreement, which said that Panagra's operations are limited to serve five Freddie traffic and that the carrier is ranking third of the bilateral which requires it to provide capacity that has in its "primary objective" the service of Third and Fourth Freddie traffic.

Airline spokesman added that while the U.S.-Peru air market is growing rapidly now U.S. carriers U.S. carriers have captured the bulk of the market. Panagra operates from its northern terminal point in Peruvia to the U.S. through interchange agreements with several U.S. carriers.

The Peruvian carrier urged CAB to institute a proceeding which would enforce the terms of the bilateral agreement with respect to Panagra's excessive capacity and Panagra's carriage to prevent future violations or suspend its certificate for non-compliance.

## BOAC Is X-Raying Britannia Tail Units

London—British Overseas Airways Corp. is X-raying the units of its 12 Boeing 707-320s to determine whether a planned tailplane modification will damage the integrity of control elevators, landing gear, and other elements of aircraft structures, as well as damage to BOAC Britannia and other aircraft of the British airline.

Tests are being made at Fairchild Aircraft, in conjunction with a British Air test team, as the airplane returns from scheduled services. As of last week 18 airplanes had been inspected but only one fault was found. There was no crack on three other El Al Britannias.

Crack was first noted on a BOAC Britannia during routine maintenance.

# Fairchild Plans to Build Advanced F-27s

By David H. Hoffmeyer

**Hagerstown, Md.**—Fairchild Stratoliner has designed two advanced versions of the F-27 twin turboprop transport as an effort to offset a projected loss of commercial customers in the mid-1970s. The two versions involve the aircraft's weight and seating in an operating role (see sidebar). The F-27 advanced version, which seats 30 in a mix and includes air conditioning system, is replacing the current two-seat advanced versions with a six-passenger cabin per the leading edge.

Despite the closure of the 30-airline 1969, a hard negotiation of the F-27's potential market has resulted in a Fairchild decision to build eight new aircraft to accommodate changes which mean on a mix and six-passenger cabin per the leading edge. Despite the closure of the 30-airline 1969, a hard negotiation of the F-27's potential market has resulted in a Fairchild decision to build eight new aircraft to accommodate changes which mean on a mix and six-passenger cabin per the leading edge.

Anticipating a Defense Department performance for U.S. origins Fairchild is considering the Gemini Express 84-C, part developed with NASA funds, for the Fairchild F-27 advanced version as a military transport aircraft in later years (F-27). Neither carries an Federal Aviation Agency certification, however, and Fairchild feels that military use should proceed, however, upon permission. Both three- and four-turboprop use pass all F-27s.

Three follow-on versions of the Fairchild Friendship proposed by Fairchild in Holland (AMW July 4 p. 40) are being developed independently and will have no immediate influence on Fairchild's planning. Should a market develop for Fairchild's stretched fuselage or high density version of the Fairchild, however, Fairchild says that it will study the possibility of a separate aircraft in the U.S. to take advantage of local aircraft manufacturing plants.

In a series of steps, completed through late 1982, these follow-on versions of the F-27, all of which are to enter the transport's base growths, are to be made available:

- F-27-300 freighter: A 62,000 lb gross weight aircraft, 127 seats in use, can take off at only 38,000 lb. The F-27G will be offered with a choice of four fuel capacities: 13,500, 17,000, 17,000 or 20,000 gallons. It will be able to carry a large forward cargo door for unloading cargo and freight loading.
- Longer range F-27: maximum range is 7,000 miles. In March, 1982, Fairchild plans to obtain FAA certification of a 20,000-lb gross weight F-27G with a fuel capacity of 20,000 gallons. Certification of a 20,000-lb gross weight F-27 with a 37,500 lb loading weight and a center line with complete scheduling for October.

**AEROBRAKE CLEAN-UP** program for the Fairchild F-27 is designed to measure the aircraft's performance at speeds of about 15 ft. per second. Advanced versions of the F-27 and all F-27 series aircraft will have a single air slot on the leading edge of the central stabilizer (1) and louvers on either side of the leading (2). Other models (3) have three leading edge mounted louvers (3) and leading mid and out parts (3, 4 and 5) which are eliminated in the new configuration. Some external liquid tanks also are eliminated.

## F-27F Payload Range Capabilities

	Midrange	Midrange	Midrange
Takeoff weight (lb.)	38,000	28,000	42,000 <sup>**</sup>
Loading weight (lb.)	37,000	27,000	37,500
Zero fuel weight (lb.)	36,500	34,500	36,500
Operating weight (lb.) with 40 passengers (max)	34,800	34,800	36,100
Maximum payload (lb.)	10,440	10,440	10,440
Range for 10,000-lb maximum payload (mi.)	390	310	390
Range for 8,000-lb payload (mi.)	540	3,850	3,440
Range for 6,000-lb payload (mi.)	540	3,850	3,440
Payload (lb. maximum)			
For 1,000-mile range	4,000 (24)	3,200 (18)	3,200 (20)
For 1,500-mile range	3,000 (17)	2,400 (13)	3,000 (20)
For 2,000-mile range	2,000 (14)	2,400 (17)	2,400 (20)
For 3,000-mile range	1,500 (10)	2,400 (17)	2,400 (20)
For 3,000-mile range	—	400 (3)	3,000 (20)
Max. range (mi.)	3,850 (24)	3,440 (18)	3,440 (20)
Range to 10,000-lb payload (mi.)	3,850 (24)	3,440 (18)	3,440 (20)
Range to 8,000-lb payload (mi.)	3,850 (24)	3,440 (18)	3,440 (20)
Range to 6,000-lb payload (mi.)	3,850 (24)	3,440 (18)	3,440 (20)
Max. range to 10,000-lb payload (mi.) with 40 passengers	3,850 (24)	3,440 (18)	3,440 (20)
**In-pavement fuel pumping system.			



**Bulletin:**  
Dramatic proof of AeroShell Oil W stability. Rocker box seizure (left) ran for 250 hours using a god straight mineral oil. Rocker box (right) ran over 1000 hours on AeroShell Oil W. Note remarkable cleanliness.

## Shell answers the ten questions you might ask about AeroShell Oil W—world's first non-ash dispersant aircraft oil

**Less oil consumption. Longer intervals between engine overhauls. Easier starting, faster warm-up, reduced wear on pistons, rings, cylinder bores, cam lobes, lifter faces, gears and bushings.**

All these benefits have been obtained with new AeroShell® Oil W. Here, in handy question-answer form, are the facts.

**1. What types of aircraft can use AeroShell Oil W?** Power engine planes of any size. Helicopters, too.

**2. Why is it called a non-ash dispersant oil?** Because it contains special additives that help keep tiny, ingrain particles in the oil from clumping together and forming deposits. These particles remain suspended and dispersed until they burn.

**3. How does this oil respond to a cold start?** AeroShell Oil W has an unusually high viscosity index.

This guards against excessive thickening of the oil when cold, yet provides surrounding lubrication when hot. Result: easier starting, faster warm-up.

**4. Is AeroShell Oil W thoroughly protected?** Thoroughly. It's had 1000s of hours of engine hours of flight time.

**5. What about oil consumption?** Because AeroShell Oil W reduces decreased wear and cleaner engine, you can expect less oil consumption.

**6. Can AeroShell Oil W reduce my maintenance costs?** If you have been

using a straight mineral oil, AeroShell Oil W can reduce your maintenance costs substantially. Because your engine runs cleaner and cooler, Oil consumption is less. Thus, you can extend intervals between engine overhauls.

**make-up oil?** Yes. It is compatible with all power engine oils now being used.

**16. Is there more than one viscosity grade? What do I look for?** AeroShell Oil W is available in three viscosity grades: 80 grade for small engines where straight mineral oil grade 55, 65, or 80 is normally recommended. Also in 100 and 120 grades for large engines where straight mineral oil grade 100 or 120 is normally recommended.

**6. How does this new oil respond to a cold start?** AeroShell Oil W has an unusually high viscosity index. This guards against excessive thickening of the oil when cold, yet provides surrounding lubrication when hot. Result: easier starting, faster warm-up.

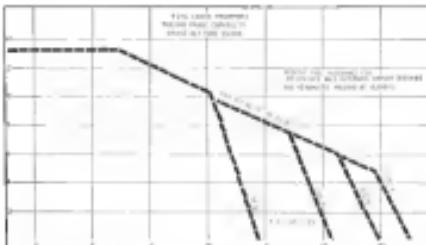
**7. Is AeroShell Oil W thoroughly protected?** Thoroughly. It's had 1000s of hours of engine hours of flight time.

**8. Where is it available?** At Shell Aviation Dealer everywhere. Any dealer will stock AeroShell Oil W if you ask for it.

**9. Can I add AeroShell Oil W to a**



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**CHART** shows payload versus range capability of various versions of the F-27G cargo transport design. All carry 3,000 gal of usable fuel in standard forward wing tanks. The greater fuel capacities would be achieved by installing bladder tanks of variable form on the F-27A loadout wing section. Chart assumes aircraft with an operating weight from 23,140 lb to 25,000 lb and large forward range drop. Charts to 15,000 ft. is at best cruise speed with continuous recommended engine power. Long range cruise speed at 25,000 ft. is based on optimum fuel consumption. The F-27G with 3,000 gal of usable fuel can carry a 5,000 lb packed 2,500 miles at then held 95 min. at 50,000 ft. and proceed to an alternate 50,000 ft. nonstop away.

F-27s currently cannot fly above 34,000 ft.

Evolution of the F-27 line to present maximum gross of 35,500 lb. is at \$8,000/lb. vs. well only about 150 lb. to do aircraft's empty weight, according to Farnsfield. As a result, about 1/3 of the weight increase can be translated into fuel load, or, in many cases, extra payload. Farnsfield also plans to market a conversion kit that will enable current operation of the F-27 to achieve the 18,400 lb. takeoff weight, the 57,100 lb. landing weight and the improved performance without increasing their aircraft to the heavier long-haul.

Farnsfield would add that its F-27 cargo program was in a state of relative stagnation for some time, a year. Then Dec. 12, 1958, until the firm of 1961 set a single transport out, sold, and the manufacturer has yet to attract a military order despite the fact that the F-27 was designed primarily as a Douglas DC-3 replacement. During all of 1960, Farnsfield had the F-27 pilot a demonstrator in its luggage racks for almost immediate delivery, but there were no customers.

After the program reevaluated the market for F-27s and increased its emphasis on table top and ground work, they then developed a new version. After all 10 were sold at the rate of one per month beginning in January, Farnsfield was forced to lay back an F-27 from the Miami Corp. in order to earn out certification testing and design improvements. According to Farnsfield, that 1961 sale brought in the highest rate of return of all F-27 sales to date. Largely because

use of Hawaian's in the new airframe building.

Before the 56th edition can be built, the Hawaian subcontractor must make whether money from a \$5.7 million 1959 Hawaian's option had come in to cover for expansion of Hawaian's facilities under all objectives of the band never have been met.

The Farnsfield representative signs it cannot.

The Hawaian Aeromarine Commission says that unless the attorney general approves the \$81,000 construction, the issue will have to be raised again where.

## Rotodyne Helicopters Planned for Caribbean

Indes Air first, a new organization which has filed for status as Puerto Rico's Virgin Islands, has signed a letter of intent with Kansas City Helicopter to buy four Rotodyne VTOLs Kansas is the U.S. service for the 50 to 60 passenger compound helicopter, under development by Westland Aviation Ltd., of England.

Delivery target is 1965. The aircraft would be used for intra-Puerto Rico routes and to the Virgin Islands from Puerto Rico. Indes Air's initial plan calls for service to the U.S. Virgin Islands of St. Thomas and St. Croix as well as the intra-Puerto Rico service.

## Coach Fare Increase Suspended by Board

Washington—Co. I. Aviation Board has suspended Brazil Airlines' plan to increase its coach fare from 15% to 33% of the first-class fare, an increase designed to defray the diversion of passengers from first-class to coach travel.

The suspension, Sept. 28, will give the Board a chance to investigate the proposal, which was intended to go into effect between certain cities (not I. Brazil) affected by the fare increase after deciding that present coach fares are causing diversion from its first-class traffic.

The carrier said that the present value of service received by I. Brazil is a far smaller to first-class travel, by far, than the current 15% differential from first-class.

Brazilian Airlines, which specified its section of the new fare system when the carrier was deriving a smaller share of the inter-island traffic, has spare about half the

Board noted, however, that this existing differential is "for primary diversion" on which the 25% coach fare differential, was originally based. It suggested that Brazil consider adjustment of seating capacity as a possible solution to defusing first-class loads.

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# Kennedy Airport Bill Nears Critical Test

By George C. Wilson

Washington—Kennedy Administration airport bill, revamped by the House aviation subcommittee to water "backdoor spending" objections, is nearing a critical test in Congress.

At stake is authority for the Federal Aviation Agency to launch a long-range program to expand and improve the rural airway system. The Kennedy Administration bill would authorize FAA to give cities \$75 million a year for five years in matching funds for airports.

Federal conservatives in the House, already mobilizing for their floor fight against the President's bill to reinforce a five-year long-range air program, do not like the long-range approach it represents. They see it as an attempt to bypass the congressional appropriations committee. They also fear that approving the airport bill will weaken similar fight against the same type of long-range approach to foreign aid.

Their main objection—especially strong conservatives on the House Appropriations Committee—is the contract authority in the Kennedy Administration airport bill. This obligates the government to give a concession to the local specified area a contract for an airport authority. If the congressional appropriations committee is forced to appropriate the assets, the FAA, under the contract authority, could get the funds directly from the Treasury—the specified "backdoor" approach.

## Holby Urges Approval

FAA Administrator Nolph E. Holby urged Congress to approve the contract authority bill "legislatively" giving Congress the funds over a period of years is absolutely essential if we are to achieve a safe and efficient national system of airports."

He cited figures showing that airports spent much more on airports when the federal air program was in a long-range contract authority period than they do now. Local authorities, he said, had more incentive to develop the public understanding and support for spending money on airports. Holby said.

But Chairman John Bell Williams (D-Miss.) of the House Transportation Committee, conceding that long-range contract authority might be more efficient, contended that Congress is responsible for funding the nation's airports.

"Undoubtedly," he told Holby dur-

ing the hearings on the Administration's airport bill, "it would promote the efficiency of that agency if Congress got rid of all of the appropriate responsibilities to the executive branch. But that is not the way the Constitution is written. I feel very strongly that this backdoor approach should be stopped in all of these agreements."

Rep. William L. Springer (Illinois, ranking Republican) on the House transportation subcommittee and Aviation Week agrees with this view. He said the bill would appropriate \$1.5 billion for airport infrastructure. The budgeted spending rate is the principal reason why the Administration's airport bill was delayed from May 15 when the hearings ended until June 29 when a decidedly revised version was sent to the panel House Interstate and Foreign Commerce Committee.

Rep. Williams described the revised bill as a compromise. It authorizes the FAA to spend whatever is appropriated in the five fiscal years from 1962 to 1966. But the House Appropriations Committee would not accept the bill as it stands.

Chairman Alben W. Barkley (D-Ky.) of the House Appropriations Independent Committee, Salazar committee, which would handle the airport appropriations separately, is seeking support for the

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aviation airports not used by the scheduled air carriers. The argument for this type of federal aid is that the expansion of general aviation airports will relieve congestion at the major fields now handling mixed traffic.

Another amendment in the Administration bill on airports asks the FAA to deny federal aid for an airport which does not have landing aids "reasoned for the safe and efficient use by means of the airport." This specific power would strengthen FAA's hand in dealing with airport officials.

These are the major fiscal provisions in the Kennedy Administration airport bill.

■ States would receive \$49,675,000 a year for fiscal 1962 through 1968 under the population formula in the present Federal Airport Act. The annual amounts would range from \$5,994,444 for Alaska to \$78,311 for Delaware. In the event of a fiscal year cut-off, states would receive a fixed amount from the federal government for their share of the airport system. The amount not utilized would go into a special fund handled by the FAA administration. They have two years under the present legislation.

■ Discretionary funds would total \$16,625,000—35% of the \$47.5-million annual total—in each of the five fiscal years.

■ FAA could assign 57 million a year for building and improving airports, "the primary purpose of which is to serve general aviation and to relieve congestion at airports having high density of traffic serving other segments of aviation." These funds would not have a deadline for use.

■ Puerto Rico would receive \$975,000 a year, and \$1725,000 a year would go to the Virgin Islands.

The states would have to match the federal contributions dollar-for-dollar on such general improvements as necessary. But they would have in proportion only 25% of the funds for landing aids, such as approach lights and non-weather distress systems. No federal money could go for airport parking lots or facilities, or for landing lights.

The current airport act, authorizing \$61 million a year, covered 14th, 7 President Kennedy, or taking Congress' 24 hr. air regulation, and "considering the progress of Federal aid to airports is essential to our national security, passenger safety and economic growth." The Airport Operators Council, American Assoc. of Airport Executives and National Assoc. of State Aviation Officials said their joint survey of airport needs concluded last fall disclosed that in the four years from July 1, 1961, to June 30, 1967, the 50 states need \$512.5 million more for airports than they can raise. (See box.)

## State Airport Financing Needs

July 1, 1961 to June 30, 1967

State	Population of State	Airports Served by FAA	Population of FAA Served by FAA	Cost of Project Planned	Funds Available and Authorized From Local and State Sources		Additional Funds Required
					Planned	Approved	
Alabama	49	3	64,340,000	\$1,181,150	\$1,454,810		
Alaska	234	108	27,100,000	17,100,000	17,100,000		
Arizona	561	23	26,810,000	14,574,210	16,000,000		
Arkansas	55	18	1,314,000	723,300	501,475		
California	213	64	123,720,000	27,266,480	42,310,118		
Colorado	36	9	16,350,000	11,350,250	7,138,416		
Connecticut	7	12	18,340,000	9,000,000	8,435,440		
Delaware	9	1	210,000	100,000	99,450		
Florida	83	22	10,442,000	25,740,487	26,302,305		
Georgia	81	7	8,350,000	4,754,650	4,315,650		
Hawaii	15	8	29,150,000	31,150,400	12,486,400		
Idaho	165	15	2,350,000	1,412,412	5,146,144		
Illinois	26	28	47,340,000	30,370,360	28,892,360		
Indiana	165	17	8,657,000	4,454,215	4,315,650		
Iowa	83	23	10,167,000	4,000,157	4,228,300		
Kansas	97	18	3,446,000	1,197,520	4,244,430		
Kentucky	31	28	18,310,000	16,600,370	12,210,370		
Louisiana	41	18	18,151,000	14,100,360	14,010,360		
Maine	29	19	6,345,000	3,212,746	2,272,746		
Maryland	34	19	14,360,000	14,160,131	4,340,131		
Massachusetts	38	61	28,024,000	21,180,000	14,240,440		
Michigan	155	19	9,457,000	9,120,544	10,292,544		
Minnesota	183	21	16,475,000	8,120,391	2,318,391		
Mississippi	44	13	12,445,000	7,120,000	8,470,000		
Missouri	81	8	1,721,000	890,000	840,000		
Montana	163	57	9,416,750	2,240,307	2,490,810		
Nebraska	19	7	7,057,750	2,495,446	2,412,428		
Nevada	13	3	4,849,000	8,119,495	2,341,595		
New Hampshire	16	2	2,441,254	1,220,000	1,217,000		
New Jersey	20	2	2,000,000	23,180,330	16,750,730		
New Mexico	36	8	2,891,700	480,314	3,187,776		
New York	64	17	38,621,000	43,950,456	48,817,818		
North Carolina	172	20	12,100,000	10,200,000	11,200,000		
North Dakota	171	27	4,821,000	2,740,400	2,247,000		
Ohio	183	19	34,681,000	11,670,360	12,439,360		
Oklahoma	74	9	13,967,000	7,264,186	8,335,814		
Oregon	42	4	4,564,182	2,548,200	2,314,407		
Pennsylvania	123	30	18,200,000	12,200,000	11,200,000		
Rhode Island	3	2	4,151,420	3,127,230	2,338,740		
South Carolina	80	30	12,911,000	7,218,000	10,386,000		
South Dakota	37	18	4,244,000	1,173,396	2,321,700		
Tennessee	65	45	10,571,000	10,200,000	14,200,000		
Texas	227	112	49,721,784	32,279,841	30,242,727		
Utah	49	49	6,341,000	950,450	5,480,073		
Vermont	36	32	1,159,000	1,400,000	1,298,500		
Virginia	31	16	1,103,400	2,448,000	2,407,400		
Washington	81	12	12,830,000	7,312,818	4,209,742		
West Virginia	62	8	4,630,000	3,045,000	3,030,210		
Wisconsin	79	49	12,159,700	8,855,672	6,198,312		
Wyoming	26	21	7,189,000	1,047,500	470,100		
<b>Total All States</b>	<b>3,101</b>	<b>1,338</b>	<b>\$1,14,000,000</b>	<b>\$26,347,721</b>	<b>\$121,641,701</b>		
Ex. Puerto Rico	18	36	8,659,000	8,455,500	4,497,500		
<b>M. S. Total</b>	<b>3,119</b>	<b>1,344</b>	<b>\$1,14,000,000</b>	<b>\$26,347,721</b>	<b>\$121,641,701</b>		

Source: Survey by Airport Operators Council, Aviation Dept. of Airport Executives and National Assoc. of State Aviation Officials and their joint survey of airport needs conducted last fall disclosed that in the four years from July 1, 1961, to June 30, 1967, the 50 states need \$512.5 million more for airports than they can raise. (See box.)

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## SHORTLINES

► **Aeroflot** has replaced its Tu-144 and IL-80 aircraft with the old-equipped, 80-seat An-104 turboprop aircraft on part of its routes because the smaller aircraft were unable to carry the required heavy loads.

► **American Airlines** reports 45 reservations on 1,300 hr of flying time for the International Telephone and Telegraph Federal Laboratories distance measuring equipment stored in jet fleet.

► **American Airlines** will provide 17 coach and 54 first class seats on its Electra turboprop aircraft after July 17. American's Electra currently have 45 first class seats.

► **Brussels Airways** night coach train fare plan has Civil Aviation Board approval for a six-month trial. Under the family plan, the head of a family purchases one full-night coach fare, and his wife and all children under 21 travel at 50% of the night coach fare. Children from two to 12 yr old fly at 25% of the fare.

► **Civil Aviation Board** will use a 92 passenger minimum as a basis for future charter exceptions applications for L-109E Super Constellation aircraft although the aircraft normally carries 92 passengers.

► **Boeing** has asked for bids on the construction of a new international airport at El Alto, a suburb of La Paz.

► **Continental Airlines** is operating 6,25 million seat miles daily this summer—5 million more than last year's peak, 43 per cent.

► **Eastern Air Lines** reports a 53% increase in revenue and a 40% increase in passenger load factor. For August, overall, the three aircraft last year.

► **Federal Aviation Agency** has issued small business loans to cabin bids by July 15 for construction of an air mail facility, a fire-drill equipment and personnel building, a vehicle maintenance building, for servicing mobile ground data equipment under at Dulles International Airport near Washington, D. C.

► **Luftansa** Germany Airlines has opened a ticket office in Denver's Aloha Hotel as part of Luftansa's expansion program in the West.

► **Northwest Airlines** has begun service with Boeing 720B jet transports between Minneapolis-St. Paul and Chicago and between Minneapolis-St. Paul and New York City via Milwaukee. Initial schedules call for one round trip flight daily between each pair of cities.

## AIRLINE OBSERVER

► One current concept of supersonic transport design is aimed at efficient cruise regimes in both supersonic and subsonic flight. Belief that the sonic boom may rule out continuous high speed flight has led to this concept. At least one engine manufacturer thinks that propellants can be made adaptable enough to give transonic operation in both flight speed ranges.

► Competitive battle between Alaska and Northwest Airlines has evolved into a public debate over the merits of high-wing as low-wing aircraft. Alaska's newspaper advertisements have been stressing the unobstructed view possible from each window in the high-wing design. Northwest is countering with an advertisement, which in at least one case runs simultaneously with the Alaska advertisement, that emphasizes the safety factor of low-wing aircraft in encounter flight. The Northwest safety pitch reads in part that "either Northwest flies low wing Snow Comets for dependability over steep winter, preferred by western carriers throughout the world. The other's above the snow."

► **Lear, Inc.** and **Stel Aviation** have signed an agreement to develop a completely automatic landing system for the Convair turboprop transport. The system will utilize ground signals that will be fed by a landing computer into the autopilot.

► **United Air Lines** is studying possibilities of installing arresting gear for its Boeing 727 turboprop stage transports. United's specification to Boeing calls for each structural strength to weigh 20% less than the basic of arrested landing loads. Device under consideration will be similar to an aircraft carrier arrest deck postament, but differences are that the wire would be caught in the landing gear rather than in a trid-hook. Landing gear would require less structural strengthening to cope with arresting load than would be required to handle a trid-hook, in the weight penalty would be less.

► Early traffic indication prior to a maneuverable cockpit for the Lockheed Electra turboprop despite some underlying wing and engine nacelle modifications. Most carriers report high load factors on Electra operating over major routes.

► **Federal Aviation Agency** has commissioned a Doppler VOR at Marquette, Mich. and will commission a second unit at Rogers Island near La Guardia Field, New York, about the first of August. Doppler VOR permits the location of a VOR unit in areas where obstructions such as buildings, gas tanks or bridges—in the case of Rogers Island—would render a standard VOR inoperable.

► **Aeroflot** will double the size of its current fleet by 1965, and approximately 65 new Russian airports will be in operation by then. At the present time, 200 of the airline's 2,000 airports are either nonoperating or being planned.

► **Three Brandon** screen-Printex do Brasil, Brazil and Venezuela will expand their production rates to reduce operating costs. The concern's name was recommended by Board's President Jairo Guedes.

► **Av. Low Fliers**, Asia, has protested a Civil Aviation Board decision denying the union's request to intervene in the temporary and inter proceeding for Southern Airways. ALFA President C. N. Suresh charged that the federal government has continued to indecisive Southern without attempting to investigate to determine whether the airline's management is meeting standards of "honesty, efficiency and economy."

► Japanese bid for an around the world route for Japan Air Lines received a setback last week with State Department refusal to permit the carrier's New York-Fukuoka route. U. S. will consider extending Japan Air Lines' Pacific route from the West Coast to New York but in withholding rights beyond because of the large number of carriers already serving the North Atlantic. Negotiations were opened June 18 without fixing a date for resumption.



# First!

SEPTEMBER 1, 1927 CONCORD, CALIFORNIA

**YESTERDAY**—a Boeing 40-B2 soared up and in the last six hours of people with record the opening of a new era in continental aviation—the first coast-to-coast passenger flight. Flying at the incredible speed of 150 mph, two passengers and cargo were landed in New York 23 hours later. The fuel—Standard Red Crown Aviation Gasoline.

This historic transcontinental flight by United Air Lines' transcon, Boeing Air Transport, marked another Standard "first"—one of a continuing series of pioneering achievements.

**TODAY** famous Chemco Aviation fuels and RPM Aviation lubricants help power United's first coast-to-coast in less than 6 hours—giving safe, dependable performance for commercial, business, and private pilots throughout the West Standard's unsurpassed research has helped lead the way in aviation... it is developing new products for tomorrow's aviation achievements.

From "yesterdays" in jet—to the development of supreme quality aviation products STANDARD IS FIRST!



Chemco departs  
Deliver safe, depend-  
able fuel and lubricants  
to all areas of the  
aviation industry.

**STANDARD OIL COMPANY OF CALIFORNIA**

## Airline Traffic—April, 1961

Region	Revenue Passengers (000)	Revenue Passenger Miles (000)	Passenger Load Factor %	U. S. Mail Tax-Audit	Domestic Pass-Audit	Foreign Pass-Audit	Freight Rev. Miles	Total Revenue \$000-000	Overall Revenue Load Factor %
<b>INTER-CONTINENTAL</b>									
America	419,209	10,417	49	8,000,000	197,740	9,746,107	8,200,000	88,544,000	55.8
Argentina	115,300	2,500	49	8,000,000	193,411	783,457	8,200,000	7,233,263	49.2
Brazil	210,400	122,416	49	8,000,000	216,321	117,000	472,149	13,585,203	49.2
Canada	113,640	70,645	48	8,000,000	104,537	80,320	80,320	7,701,720	38.6
Chile	318,437	102,819	49	8,000,000	246,108	1,299,395	28,000,000	32,000,000	33.5
Ecuador	481,501	127,364	48	8,000,000	102,368	7,082,266	7,082,266	7,082,266	43.8
Mexico	118,274	78,724	48	8,000,000	130,792	48,337	382,491	7,107,438	44.2
Peru	67,391	49,231	48	8,000,000	84,479	45,451	440,307	4,796,449	48.4
Uruguay	24,440	5,856	48	8,000,000	14,349	4,349	4,349	4,349	42.7
United States	471,693	478,287	49	8,000,000	1,020,237	7,180,000	32,414,767	32,414,767	35.9
Venezuela	64,413	60,614	48.5	8,000,000	747,344	104,266	104,266	104,266	43.8
<b>INTER-CONTINENTAL</b>									
America	7,451	8,303	47.8	9,000,000	1,026	90,137	3,146,468	14,468	56.9
Brazil	4,712	10,104	41.8	8,000,000	25,197	111,321	1,286,394	2,190	51.1
Colombia	45,321	100,100	41.8	8,000,000	2,100	4,343	4,343	4,343	42.7
Ecuador	1,300	1,739	48	8,000,000	1,912	1,912	1,912	1,912	56.8
Peru	47,129	70,724	43.9	8,000,000	184,518	422,249	7,116,429	82.4	56.8
Uruguay	12,141	3,480	43.1	8,000,000	100	8,000	8,000	8,000	40.6
Venezuela	10,402	19,721	43.8	8,000,000	1,334,070	1,078	218,204	4,214,070	44.8
Pan American	4,159	4,304	43.1	8,000,000	4,346	3,509	1,284,394	6,649,394	48.8
Argentina	11,127	18,000	41.8	8,000,000	2,100	4,343	4,343	4,343	42.7
Latin America	84,299	106,149	48.9	8,000,000	641,211	2,081,211	16,915,181	39.2	56.8
Pacific	42,910	171,018	47.3	8,000,000	5,761,249	12,318	2,391,023	32,331,267	40.9
Passenger	10,450	18,143	48.8	8,000,000	78,246	424,118	424,118	424,118	38.7
Cargo	317	849	43.4	8,000,000	1,148	3,167	81,762	34.8	56.8
Trans-Continental <sup>1</sup>	7,000	10,047	42.3	8,000,000	1,027,814	3,729,592	10,039,754	14,468,449	44.8
Trans-World	71,015	10,849	42.3	8,000,000	1,027,814	8,159	102,049	3,729,592	38.8
United	10,121	20,347	48.7	8,000,000	220,471	8,159	102,049	3,729,592	38.8
Russia	2,371	5,394	48.7	8,000,000	7,448	8,159	8,159	8,159	38.7
<b>DOMESTIC SERVICE</b>									
Alaska	47,857	16,311	48.8	8,000,000	30,740	9,181	64,938	1,609,419	44.8
Arizona	18,939	8,235	48.8	8,000,000	7,793	2,391	12,231	83,262	38.9
California	19,321	5,731	48	8,000,000	12,658	7,037	18,110	504,420	41.7
Connecticut	21,971	5,103	38.2	8,000,000	8,728	27,244	18,326	188,287	38.3
Delaware	48,203	11,637	48.8	8,000,000	8,370	21,804	25,143	1,179,349	44.1
Florida	70,191	12,651	48.8	8,000,000	43,559	43,559	56,218	1,043,753	47.9
Illinois	47,204	8,023	44.3	8,000,000	21,207	36,383	41,207	400,849	44.1
Massachusetts	43,199	1,996	48.8	8,000,000	13,549	15,339	13,430	988,727	46.8
Michigan	33,710	2,792	38.2	8,000,000	23,201	11,764	18,327	625,440	38.9
Mississippi	27,242	4,184	48.8	8,000,000	21,103	11,790	16,316	470,740	40.5
Missouri	30,183	7,207	48.8	8,000,000	12,179	4,481	15,659	322,120	41.4
<b>PACIFIC</b>									
Alaska	31,580	1,709	48.7	8,000,000	2,411	4,704	386,894	38.7	56.8
Hawaii	36,251	1,281	48.7	8,000,000	4,138	128,518	344,013	344,013	38.4
<b>CARGO AIRLINES</b>									
Aero-Asia, Sud American	3,316	12,399	48.3	8,000,000	33,039	11,924	11,924	11,924,000	48.9
Pring, Star	12,391	12,391	48.3	8,000,000	11,924	11,924	11,924	11,924,000	48.9
Transoceanic	1,000	1,000	48.3	8,000,000	1,000	1,000	1,000	1,000	48.3
Inter-Continental World	1,000	1,000	48.3	8,000,000	1,000	1,000	1,000	1,000	48.3
<b>HELICOPTER USES</b>									
Chemco Aviation	15,258	546	48.2	8,000,000	1,129	3,299	3,299	34,107	37.5
Los Angeles Transport	15,258	1,129	48.2	8,000,000	2,027	1,129	1,129	34,107	41.7
New York Airways	12,401	546	48.4	8,000,000	1,046	107	107	34,096	36.7
<b>ALASKA AIRLINES</b>									
Alaska Airlines	8,243	7,442	51.3	8,000,000	5,477	593,844	1,237,219	82.4	
Alaska Central	9,653	310	51.3	8,000,000	3,827	2,850	30,739	41.3	
Cordova	1,231	263	48.4	8,000,000	4,424	40,859	40,859	40,859	39.9
Eagle	8,200	800	51.3	8,000,000	1,127	2,027	2,027	2,027	44.8
Kodiak	472	243	48.2	8,000,000	373	443	443	443	34.8
Northern Consolidated	1,700	631	51.2	8,000,000	45,514	80,212	181,412	181,412	57.1
Pacific Northwest	8,305	7,434	48.2	8,000,000	11,239	408,100	1,364,912	52.4	56.8
Sea Air	989	1,107	48.1	8,000,000	54,857	75,341	204,387	204,387	38.2
Southwest Alaska <sup>2</sup>	3,200	371	53.9	8,000,000	48,360	117,854	124,746	51.1	56.8
Alaska Seawise	8,159	307	48.8	8,000,000	3,047	261	36,848	36,848	38.2
<b>NOT AVAILABLE</b>									
<b>Domestic Airline Traffic—April, 1961</b>									
<b>Compiled by AIRLINES WITH DOMESTIC AIRLINES REPORTS IN THE Civil Aeronautics Board</b>									





**FIFTH TURBOFAN-POWERED** Douglas DC-8 N901UA was born in Aviation Week's test pilot report. United Air Lines plane (left) the long-range aircraft on United's service constantly flies Chicago-Hawaii nonstop. Normal range at full gross is 5,000 miles.

## Aviation Week Pilot Report:

# Turbofan Engines Extend Range of DC-8

By William S. Reed

Long Beach, Calif.—Despite a 49% increase in takeoff thrust offered by Pratt & Whitney JT3D-1 turbofans on the Douglas Series 50 DC-8 in twin-jet low-speed handling qualities, steering from a control column strength attributable in part to limiting wing sweep to 10 degrees.

Although 21 mph slower in maximum permissible speed than the former jet transports, the turbofans powered DC-8 will cruise economically with high payloads over long ranges. The maximum long-range speed is comparable to that of the Douglas DC-8-30 transports and fuel costs should prove to be less of a factor in short operating costs.

Douglas says it has enough fuel safety margin to meet that order.

### Qualitative Data

In effect qualitative data from Aviation Week's pilot made no flights totaling 5 hr in the No. 5 aircraft powered with Pratt & Whitney turbofans. The writer soloed along as an observer in the No. 5 aircraft on a semi-global flight during Federal Aviation Agency functional and reliability tests. During this 14,000-mile test in 100,000 ft of altitude, to demonstrate the long-range capabilities of the craft, the following points were noted:

- **Starting flight** from Long Beach, Calif., to Hawaii (cruising 6,500 ft/100 hr, total 31 hr 17 min). Takeoff

from Long Beach was made at 251,000 lb, which included 53,015 lb of fuel and 18 crew members and cleaners. The aircraft, however, longer in certified dimensions, gave weight credit that had to be overcome—114,000 lb. Landing at Leonardo da Vinci Airport near Paris, which was made with 21,000 lb of fuel remaining, enough for another 1,000 miles at altitude, with ample reserve for approach and landing. Long Beach departure was 63 hr 42 min.

Starting and maneuvering response during the FAS test flight matched 72-mph maximum airspeed. It is a maximum speed, varied about on the trip. The aircraft was not, as was the case with three Series 50 DC-8s which since have been delivered to KLM Royal Dutch Airlines.

Yardstick used for the Aviation Week flights was N901UA, the 37th DC-8 off the Douglas line and the second jet twin-jet aircraft in United's fleet. At Long Beach, takeoff weight for the first flight was 189,400 lb, including 65,700 lb of fuel and 20,000 lb of passengers. The aircraft's weight at 100,000 ft was reduced to 122,000 lb, but both flights were production tests to shake down the various systems in the craft and to verify evaluated, initially, the aircraft's operating performance envelope.

A feeling of confidence is gained when sitting down over the left seat of the DC-8, probably due to Douglas' effort to make the layout easier to remember. The first impression is that of spaciousness, the concavity of the nose gear steering wheel located near the pilot's left hand, and control of a 75-degree sweep in the vertical. An additional power handling boom is offered by the right hand, which also gives steering control in the middle perch.

The aircraft is not a trim aircraft for short takeoffs and landings, but it is a trim aircraft for long-range flights. The aircraft is not a trim aircraft for short takeoffs and landings, but it is a trim aircraft for long-range flights. The aircraft is not a trim aircraft for short takeoffs and landings, but it is a trim aircraft for long-range flights.

- **Control** Long Beach leg of the flight covering a ground total of 5,000 miles was made in 7 hr 45 min for an average speed of 491 mph and total 1,000 lb of fuel.
- **Turbofan** For the trip, Long Beach start was 180 mph, 10 hr 41 min, average block-to-block ground speed



**FAW CASCADE** in the stowed position (left) allow for the smooth flow of bypass air from the forward fan of the JT3D-1 engine. Effectiveness of thrust reversal as fuel from engine was vented during a landing flight at Ontario International Airport, Calif.



180 kt appeared on the airspeed. Check schedule was held at 3.75 Mach when it connected with 280 at 10,000 ft. This was held right leading up to 35,000 ft, indicating 75 and 250 kt.

Check to 35,000 ft, took about 35 sec, including time out for a series of stalls at 30,000 ft.

Crash conditions were established at 35,000 ft and the aircraft settled down to 30,000 ft Mach 0.75 (375 ft/sec) with EPR setting at 1.7. Fuel flow was 2,619 lb/hour/second and maximum speed figure was 773 ft/1,540 mph. At long range, the aircraft was held at 30,000 ft, indicated 31 indicated and climbed in traffic dictated to near the maximum unaccelerated altitude of 42,000 ft. This procedure was used on the morning flight to Hawaii and will be used again by the KLM and United on long hauls.

Operating at faster cruising Mach numbers puts the aircraft further out the drag cone, which adds only small percentage of lift to total weight out of all propulsive to viscous in fuel consumption. This is characteristic of all large swept-wing jets which find their most economical cruise speeds at around 0.85 to 0.9. Only the aircraft of working aerodynamic schedules can take full advantage of this fact that maximum speed is 0.82 Mach number, but 0.85 to 0.9 the example of 25,000 ft are fuel consumption reduction one to 10%.

The DC-8 that was taken out when the aircraft operating limit (V<sub>1</sub>) warning bell sounded. Landing qualities remained good and aerodynamic noise margin was at a nominal level that has made the drag due the aircraft was operating could be seen by observing the amount of extension of the pitch trim compensating stick on the cockpit's control column. The aircraft also was operated in the drag due without the benefit of pitch trim compensation with the increasing wind

speed. Check to 180 kt, airspeed of 500 lb/sec showed that the DC-8 has good fuel economy with pitch, but not much with change imposed with power changed.

The automatic pitch trim compensator (SPC) which turns against the aerodynamic load that commences at 0.78 Mach issue lets pilot in

Concave lenspower less is +1 for x 10 but -the largest in the world.



## Mach 3 Technology

Torturing aircraft structures with the world's largest "gramophone" to determine the exact frequency at which they vibrate.

**gramaphone.** To predetermine in-flight stresses on an aircraft as advanced as the Air Force's Mach 3 B-70 Valkyrie, it was necessary to make sweeping advances in the state-of-the-art of testing guided-arms.

One way the Los Angeles Institute of North American Aviation met this challenge was to build the largest, low-noise acoustical test chamber in the world. Here, a maximum 47 foot by 30 foot concrete loudspeaker box can blast around structural openness with up to 170 decibels of noise. This is equivalent of 54,000 firecrackers exploding full blast, yet ingenious sound-isolating keeps this noise to mere noise than a diamond whetstone outside the box. The noise inside the lab is so great that the heat generated could ignite fiber glass insulation material.

### Dimensions of the B-70 Hypersonic

THE LOS ANGELES DIVISION OF NORTH AMERICAN AVIATION

down aircraft becoming obvious as speed built up. It was possible, however, to hold straight and level without trimming but at the expense of considerable full force on the rudder. Force required was not high enough for real function of PTC to be a "go/no-go" item in passenger operation.

Steering trim is accomplished either by a thumb-operated switch on the front wheel or by use of a conventionally located trim switch on the center console. Button-operated selector trim is not included in the DC-8 as the form of a four-way switch, i.e., trim and altitude trim, were not used on the aircraft. It is necessary to switch the selector trim switch with the right hand and the position is somewhat awkward since the switch is located behind the plane of the pilot's seat back.

Recovery from pilot-induced instability such as Dutch roll was accomplished by straight forward techniques both visually, and on instruments; i.e., sonic level by use of alarms was stopped by use of rudder.

Flight recording is very effectively provided by a fast magnetic recorder for the horizontal and the main exhaust-gas recorder under direct drive. Operation is pneumatically governed and designed specifically so that any malfunction in the system will cause the recorder to fail in the "all possible" positions. Attention is again with only a brief pause at afterburner necessary while the mechanism is in transition. Position lights on the instrument panel let the pilot know the recorder positions.

In flight, numbers two and three engines can be operated at reverse thrust up to maximum continuous power rating that rapid descent can be made in case of emergency. Lockout devices prevent numbers one and four engines from being reversed unless there is weight on the landing gear.

The DC-3 employs an afterburner high speed drag or heating device after that thrust reversal which appears to cause less offsetting and milder turn changes than spoken by other space boosters.

During the activation lights shone that the servicer cycle was complete, radio communication power was applied to the radiohounds while sending over several to operation 0.88. Much number of the messages were accepted. Please note angle 30 deg. and the rate of descent about 15,000 ft/min. Descent from 42,000 to 12,000 ft can be made in this manner in less than 2.5 min.

urch the board on neither and aeronautics committee. Although not capable of rolling with fighter-like agility in that committee, the DCI was safely controlled through all REECHIFI ENCLIPS-133.

Our landing was made at Ontario International Airport to check the functioning of the electronic apparatus, complete with the HES. Downstream flow was measured at 380 ft with Raps up. The HES's main weight by this time was 175,000 lb. Flaps were lowered to 25 degrees and airspeed reduced to 145 kt, due to encroaching the natural levee. The couple worked very well

egrate the nose art of intercepting the beaker at a 10 deg angle. At glide slope interception, airspeed was reduced to 115 kt. In the B-57s were lowered to 90 deg. Automatic approach was discontinued at the middle marker and a visual landing executed without additional run from approach speed. Glide speed for this weight was 125 kt. Control column is a panic and requires no "holding" on the pilot's part.

POLARIS PROVEN  
CONNECTORS

# LIONEL

### Extra Reliability With—

- Rugged Die-Cast Housing
- Durable Phthalate Moldings
- Beryllium Copper Contacts For Extended Insertion/Withdrawal Life



Five sizes, 36 to 104 contact range • Also available for #16 wire terminations • Most applicable MIL spec  
• Materials & specifications modified to meet your

• Write for Series W35-39

■ Würfe für German W35-03

The logo for Lionel Electronic Laboratories, featuring a stylized 'L' inside a circle.

(Formerly Asian Electronic Laboratories)



GLASS PIER and balsa model has been dropped from 4,000 ft. to test static characteristics of Boulton Paul 167 bawp, this data research staff due to fly this summer. Engineers on the 115 will be difficult to spot. Normal recovery must be electric.

## British Study Space, Supersonic Craft

By Herbert J. Cokanah

Farnborough-Britain's Royal Aircraft Establishment is working on a wide variety of designs ranging from space vehicles to aeronautical problems of supersonic transports.

In aeronautical design, RAE says more research work is required on aircraft as an integration of high angle of incidence regions such as in the Handley Page 110 delta delta aircraft due to fly soon in the testing shape of both canards. The British aircraft unit has 6,000 employees (1,600 of them scientists) at Farnborough, Bedford, Aéroport Liphurst, West Drayton and Cardiff. The latter is most concerned with missile and drone testing.

At Bedford, engineers are varied sonic wind tunnels from low speed to hypersonic, to test VTD models. Initial efforts on flight over canards such as balsa bars, and measurements of shock patterns using the Schlieren technique. Considerable static test work on the Mach 2 aircraft. This has been done at Farnborough and Bedford.

Extending over the field of wind tunnel investigation is research for pilot helmets which combine flight with bending in determining the track, ground speed or rounded with north and east west components. The committee also has a research slot for vehicles in flight through the atmospheric density, the air of Europe, to stiffen North America's communications with Europe. This will be controlled by the pilot. The entire unit was first flight tested in February 1966. Component parts were built by I. Aeronautical Engineers, which have not yet been explained.

The delta shows the airplane's ground position and track superimposed on the colored topographical map at a resolution of about 45 mm. in the scale can be either 1:90,000 or 1:1,000,000.

The delta is driven from a narrow road carriage which contains flight deck with bending in determining the track, ground speed or rounded with north and east west components.

The committee also has a research slot for vehicles in flight through the atmospheric density, the air of Europe, to stiffen North America's communications with Europe. This will be controlled by the pilot. The entire unit was first flight tested in February 1966. Component parts were built by I. Aeronautical Engineers, which have not yet been explained.

### Recent Activities

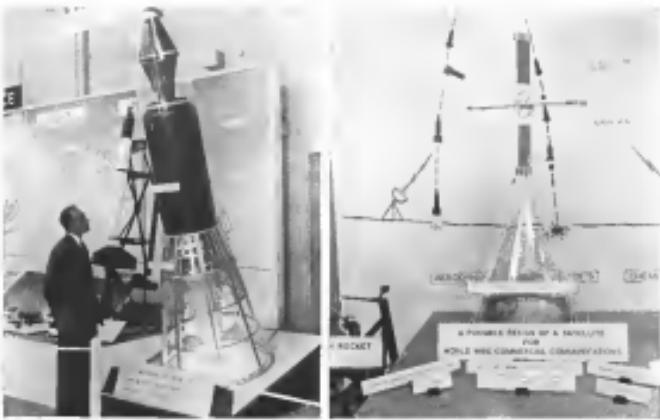
In recent times the Royal Aircraft Establishment has devoted more of its attention and capabilities toward aeronautical investigations and the life sciences, according to M. J. Lightfoot, director. This unit has authority to develop all types of research and development of codes, measurement devices and a Type B full-motion seat and when other pressure is high.

The unit is lightweight and consists of a reduced-size flight seat frame, two outer frames, and a folding bellows with a transparent Melmac window which snaps over the pilot's head as an emergency. The seat weighs only about 12 lb. and gives the pilot a high degree of stability.

Lightfoot said considerable emphasis now is given to aeronautical transports in comparison with French ONERA. The British are working on a long-range model of a Mach 2 plus aircraft and the French are interested in medium-range transports. Lightfoot predicted a supersonic transport will be built



EXPLOSIVE DECOMPRESSION effects are studied in cabin pressurization to Vireo and Vulture single stages by British Royal Aircraft Establishment



BLACK KNIGHT testbed model (left), on track 1,000-mi. altitude. Model communications satellite design has sole feature

Black Knight test as a first stage, plus the French Vireo and another unnamed project which has been proposed for a European consortium of nations by Minister of Aviation Peter Thomsen.

### Flight Tests

Farnborough does considerable flight test work and currently is flying an Avro 707G in a program of electrical control systems. The airplane is a tandem two-seater with right seat test seat fitted with varied electrical gear, which actuates hydraulic controls. A Vickers she is being used for various

Rheinmetall heat-seeking missles. Nose effects on helicopter rotor blades are being studied on a British Système helicopter, with an instrumented de Havilland Chipmunk being used to make photographic and electronic measurements in often atomic conditions.

Another test project involves a Gloster Javelin fitted with a supersonic flight regime air in blue can off the plane's airfield. The supersonic flow has a maximum heat load of 2000 degrees centigrade at 2000 seconds measured on the wing surface.



WIND TUNNEL MODELS tested low drag conditions for design of Mach 2 civil jet from Boulton Paul with competing with French competitor, ONERA



### Space-Age Project "HEAT FOIL"

## A CHEMICAL EXPEDITION...



... searching for plastics materials that can "take" temperatures of 20,000° F. plus

*Massando has developed high-heat-resistance resins for laminates that remain intact for upwards of 2-3 minutes at temperatures as high as 40,000° F.; that maintain integrity for 200 hours at 400° F. Under evaluative use plastics laminates that hold promise for rocket nose cones, sonar, and other components exposed to high heat.*

By applying basic knowledge of polymer chemistry to the problem of service life under heat, Marusawa is making new breakthroughs on the problem of high-heat resistance with plastics. One of the most promising plastics now being evaluated is a silane-modified poly-formaldehyde resin which makes laminates and moldings that retain integrity after hundreds of hours of exposure to temperatures of 300° F. Still other polymers under development hold promise of broadening temperature resistance for increasing lengths of time.

#### MOLECULAR DISSOCIATION SETS UP COOLING ACTION

Some rooms under study form a clear layer which insulates the interior and reradiates a large portion of frictional energy. Plastic laminates made from such rooms provide insulating walls for interior surfaces of

#### HEAT RESISTANCE—PLUS STRENGTH AND LIGHT WEIGHT

As in many other fields, laboratory tests for space-vehicle science are hard to correlate with actual field performance. In standard Oxygen-toxicity Tests and Staub-lined-Arc Tests, heat-resistant plastic laminates show adequate resistance to

structural integrity under high-heat stress. Like other, more common reinforced plastics, the new heat-resistant laminate have exceptional mechanical strength. The following table indicates some of the mechanical properties obtained with a 1/8" section of a laminate made with a Monsanto phenyl-modified phenol-formaldehyde resin.

Property	Results	MR-A-4199 Specification
<b>Firewall Resistance</b> Standard Condition 75° F. 100 Deg. Water Immersion 100 hrs. to 500° F. 200 hrs. to 600° F.	75 hrs. and 72 hrs. and 84 hrs. and 51 hrs. and 23 hrs. and	50,000 40,000 40,000 20,000 No Spec.
<b>Insulation Efficiency</b> Standard Condition 75° F. 100 Deg. Water Immersion 100 hrs. to 500° F. 200 hrs. to 600° F.	3.73 x 10 <sup>4</sup> 3.68 x 10 <sup>4</sup> 2.28 x 10 <sup>4</sup> 1.48 x 10 <sup>4</sup>	3.0 x 10 <sup>4</sup> 2.85 x 10 <sup>4</sup> 3.0 x 10 <sup>4</sup> No Spec.
<b>Tensile Strength</b> Standard Condition 75° F. 100 Deg. Water Immersion 100 hrs. to 600° F.	48,100 psi 45,600 psi 23,100 psi	40,000 38,000 No Spec.
<b>Expansion Coefficient</b> Standard Condition 75° F. 100 Deg. Water Immersion 100 hrs. to 600° F.	53.000 psi 47,800 psi 9,240 psi	35,200 35,200 No Spec.
<b>Barrel Hardness</b>	78	58
<b>Permeability</b>	Bar II 4000 cc/inch <sup>2</sup>	1.0 min.

**Maximum Properties of Buna-N 1010 Laminate (1/8" x 1/8" x 1/8" sheet, E.C.S. 320-104 glass cloth, 12 plu. 300-40 pressure cured 1 hr at 200°F, post cured by heating at 300°F/24 hrs, then at 200°F/1 hr, cooled 20°F).**

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In addition to the properties described, the plastic laminates created for high-heat resistance are practically immune to fuels, oils, and solvents.





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EXPERIMENT with plasma thermocouple diode is conducted in the Volcoke Atomic Laboratory of General Electric's Atomic Power Equipment Department in connection with a nuclear fusion powerplant by space vehicles.

## AMP INCORPORATED

GENERAL OFFICES: HARRISBURG, PENNSYLVANIA

AMP products and equipment described are available through authorized companies in Australia • Canada • Denmark • England • France • Ireland • Italy • Japan • Mexico • West Germany

**FACT**

Flexible Automatic Circuit Tester

## Cut the cost of circuit testing

Eliminate the costs of developing special probe test equipment for each production program. Cut the time required to verify the wiring integrity of electrical assemblies. Reduce the amount of valuable space required for overtest lead-in. With the Hughes developed **FACT**—short for Flexible Automatic Circuit Tester—you get a module, general purpose test unit that quickly detects and isolates continuity and high potential faults.

**FACT** is a high capacity unit—it can program complete tests on an unlimited number of circuits. **FACT** cuts down programming time, dramatically—it uses standard IBM systems. **FACT** substantially reduces trouble shooting time.

**FACT** is self-calibrating and self-testing—thereby substantially increasing the confidence level of the circuit test.

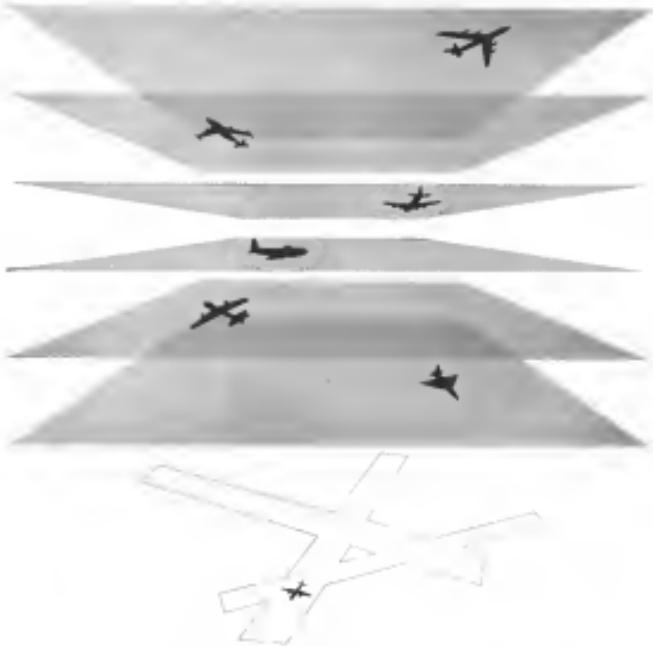
**FACT** is a production proven and tested system. With three drives—**FACT** needs only one programmed program and 1 tape per programmed Hughes can meet every circuit testing problem.

Write to L. W.

Rainer Hughes, 41 Banguela, L.A. 45, California. Or better yet, call him at Oregon 6-8862. Ext. 1882.

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GENERAL ELECTRIC COMPANY





## Cubic MOPTAR—key to jet age collision avoidance



NOPTAR requires only the states that the provider is sub-participating in:

Using glass-stainless steel antenna, with an in-line prime, a single CIRIS MDPTR general station (like the one already in operation) can be expanded to provide a 3-dimensional position data in an area as big as 400 nautical miles. The expanded system can also provide initial and accurate minimum safe altitude identification, conflict prediction, and navigation data. To assist enroute, MDPTR system information would be automatically and continuously processed, and potential conflict data transmitted to the aircraft through a SHOPTAN (coupling Cables, precision ENH (Distant Measuring Equipment) and AME (Angle Measuring Equipment) interface). For more information, write Dept. A99-197, Cessna Corporation, Santa Clara, CA, 95051.



EMPLOYMENT OPPORTUNITIES - Many challenging career opportunities available in the business, professional, and educational fields.

heat is transferred from the fuel by heat conduction and radiation losses. When current flows, heat is transferred from the electrode to the mode by electron cooling. While this might tend to drop cathode temperature, resulting in a heat temperature drop, the reactor temperature would remain at a much level after the reactor generates power as a result of the positive feedback effect caused by the fuel temperature drop.

investigating the reaction in a furnace can. General Electric engineers compiled a summary of proposed potential performance characteristics based on this, levels of converter technology. The first of these evaluations is based on laboratory experiments completed in progress. The second or prototype level is an estimate of the outcome in the furnace technology, expected by the end of 1970. The third level is the production, while the final set of performance figures presume use of advanced technology resulting from a vigorous development program, continuing through bench qualification of the powerplant.

In each case, the weight (1.100 kg) and guided photon dimensions (16 mm long, 15 mm diameter) are identical so that the shield is operable at higher temperatures, length made possible with insulated materials, locates the test point beyond reducing the specific weight beyond per kilogram of the material. For the three times cited above, the output power increases from 15 to 25 kilowatts and falls to 3 kilowatts at the final startup. The specific weight for the three cases cited is 1.100, 1.040, and 0.980 kg/cm<sup>3</sup>. Induced thermionic conversion of 10% efficiency are assumed throughout (although one series with  $\beta$  factors up to 17% are cited with 1.100 kg/cm<sup>3</sup> shield weight), the output would be 14.4, 13.1, and 12.0 kilowatts.

The STAR powerplant exploits the high temperatures possible in the molten salt source to attain the high power outputs possible from thermonuclear reactions at elevated temperatures. The temperature in the final powerplant would be 2,400°C., cathode temperature 2,350°C., and reflector surface, 1,650°C.

General Electric plans to use refractory materials, such as tungsten, boron, molybdenum and molybdenum as the powerplant constituents. Fuel for the reactor would be uranium carbide-zirconium carbide solid solution.

The STAR powerplant is an outgrowth of an extensive program in fiber research both here and at other General Electric facilities. This research creates a nuclear thematic program maintains basic studies in physics, materials, applied converter development and systems efforts.

## CAPABILITIES REPORT FROM BENDIX PIONEER-CENTRAL

## INERTIA SENSING



## **INERTIA SENSING EXPERIENCE KEYED TO YOUR NEEDS!**

From basic inertia sensing problems to the most sophisticated needs, we do it.

—during the past 10 years—has been establishing constantly higher and higher standards in designing and producing medical sensing devices. Torn & Sito Industries, Inc., located in Champaign, Illinois, is

above, including Accelerometers, Vertical and Rate Switching Gyros, Regulating Accelerometers, Single and Double Integrating Accelerometers are all part of the solutions that has made Pioneer Control a leader in this field. Here are exper-

PIONEERING IS OUR BUSINESS

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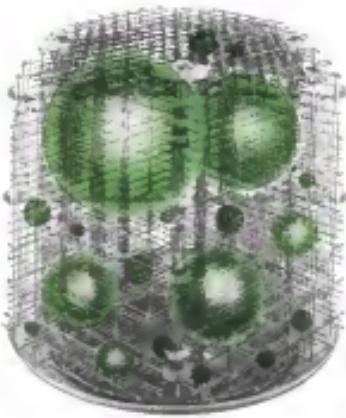


For the first time, atomic energy is being used in a space vehicle. Signals picked up from the Jason Tranit navigational satellite have been transmitted successfully by a radioisotope-fueled thermoelectric SNAP™ generator. This is the beginning. The use of atomic energy—for propulsion as well as auxiliary power—is essential for man to range at will and for extended periods in Space. Atomic energy is the most compact source of power known. The device was designed, developed and built

for the U.S. Atomic Energy Commission by the Nuclear Division of The Martin Company. It provides electricity for instrumentation and for two radio transmitters in Jason, a satellite developed for the U.S. Navy by the Applied Physics Laboratory of Johns Hopkins University. Capable of providing continuous power for many years, the generator's total output will be comparable to that of several thousand pounds of chemical batteries. \*System for Nuclear Auxiliary Power

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whatever a liquid's state or attitude, whether still or in agitation, the volume indication is the same with the Liquidometer Meter. Liquid Quantity Gauge. A capacitor type measuring probe - intercellular in construction - is the heart of the system, in addition to actuating an indicator, output can be telemetered, used for control purposes, or fed into computers. Potential applications: measuring liquid oxygen for astronauts; gauging liquids in advanced rocket propulsion systems; all-altitude gauging of aircraft fuels. Technical details in Booklet 694.

In the design and production of advanced instrumentation - electronic and electro-mechanical - Liquidometer offers many widely demonstrated capabilities, plus the intent and the willingness to pioneer. We welcome the opportunity to apply these qualifications, and our 40 years of experience, to your instrumentation requirements. Write for our capabilities brochure.

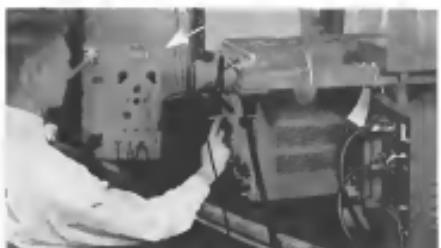
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of power quality

Since 1920



(INCREMENTAL power spectrum analyzer (inset), developed by Hallicrafters for testing ECM equipment and microwave tubes, provides instantaneous display of average power levels in 10 msec increments over a band of 2,150 mc at 5,000 watt high average.

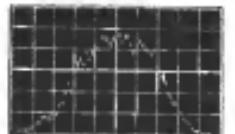
#### Device Checks ECM Performance

Six devices for checking performance of electronic countermeasures (ECM) equipment for electronic warfare instruments, and for intercepts, not of microwave power tubes, have been developed by The Hallicrafters Co., Chicago.

The new instrument, called *in incremental power spectrum analyzer*, provides a continuous and instantaneous display of average power output levels in 10 msec increments over a band of 2,150 mc. The direct reading of RF power and RF spectrum is made with an accuracy previously obtainable only in time-consuming, point-by-point measurements, according to Hallicrafters.

The first model to become available commercially, covers the frequencies from 2,400 mc to 3,600 mc (8 band). A similar analyzer for L-band will be made soon, and company expects to bring out additional models to cover the spectrum from 50 mc to 12,000 mc.

The analyzer measures 125 fixed tuned narrow-band (30 watt) around video screens. The output from each is subjoined to give a dc signal proportional to the time average of RF



DISPLAY is of average power vs. frequency obtained by use of new spectrum analyzer. It was created by FM noise modulation of a voltage tunable magnetron.

AVIATION WEEK, July 10, 1961

design  
experience



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### THEY RELY ON RADIATION for high-speed X-Y plotting

This XY Plotter, designed and built by Radiation for Kirtland AFB, plots five variables graphically against a selectable fifth variable from magnetic tapes generated by digital computer. It also provides identifying notations and text in alphanumeric characters at a speed of 90 dots per second.

Radiation engineers achieved a number of technological advances with the Plotter. For example, this highly automated equipment provides quick selection, independent scaling and strobeing for each variable. It can reproduce an unlimited number of report-quality copies of the plot. Advantages of the system are inherent digital accuracy, savings in time and labor, and simplified analysis of sequential data.

All plotted variables will receive identification by notations, either liquid or heat, creditable to original source.



point-to-point precision which non-linear plots, arriving in the computer.

The new analyzer is reported to be useful for electronic circuit measurement applications. For example, a radio operator can use it to determine which frequencies in the spectrum are not being printed by an encoder in order to know where to shift the radio's operating frequency to avoid passing.

The new analyzer is available as standard armament equipment, can be installed in a C-130 aircraft in a permanent or temporary condition. Device measures 104 x 172 x 213 in., weighs 48 lb. and draws 1.75 amps at 115-1, 60 cps power. Price of the unit is \$14,800 FOB 8th Change with delivery in 60 days, according to Holloman.

### Novel Semiconductor Transducer Developed

Semiconductor strain-gage pressure transducer with a built-in bridge which is temperature compensated over the temperature range of -40° to 250° has been developed by Division Division of American Brake Shoe Co., Cambridge, Mass.

The high output is achieved through without amplifiers.

The composite case it has been able to achieve compensation over the wide temperature range, without exceeding high output voltage.

Division says its new PT-530 pressure transducers are accurate to within 1% of full scale, relative to room temperature static calibration source, taking into account all sources of instrument error—repeatability, non-linearity, hysteresis and the combined effect of temperature.



**NEW SENSITIVITY** pressure transducers, using semiconductor strain gage, has output of 5 volts, per g force of 1000 and is now protected over temperature range of -150° to 210°F using new technique.

*The Lincoln Laboratory program for ballistic missile range measurements and penetration research includes:*

### EXPERIMENTAL RESEARCH

Measurements and analysis of ICBM flight phenomena for discrimination and for design purposes, including optical, aerodynamics and RF effects.

### SYSTEM ANALYSIS

Studies to apply research findings to advance the technology of ICBM and ACM systems.

### INSTRUMENTATION ENGINEERING

Designing radar, optical and telemetry equipment with which to measure ICBM flight effects under actual range conditions.

### RADAR SYSTEMS RESEARCH

Extending the theory and application of radar techniques to problems of discrimination, countermeasures and performance in a close-target environment.

### HYPersonic AERODYNAMICS

Study of the flow fields around reentry bodies for various body designs and flight conditions. Excellent computer facilities available.

### RADAR PHYSICS

Theoretical and experimental studies in radar back scattering interaction of RF radiation with plasmas.

A more complete description of the Laboratory's work will be sent to you upon request.

All material applicants will receive nondisclosure by agreement without expense to cover costs, labor or related expense.



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This world-wide communication network will help Strategic Air Force leaders exercise command and control almost in response to events of the moment. Yet the forces involved are dispersed throughout the world, the volume and complexity of information unprecedented. The SAC Control System will be a product of the new technology of automated information processing systems. We have helped create this new technology, beginning with our work on SAGE. In projects such as SAACS and RAGC, we perform system analysis, information processing system design, and training of personnel in system use. And as a continuing effort, we carry on research into future generations of these control systems.

Scientists and engineers interested in joining an interdisciplinary approach to system development are invited to inquire about our rapidly expanding efforts. Positions are open for Operations Research Scientists, Computer Programmers, Engineers, Human Factors Scientists at our Santa Monica, California, Lexington, Massachusetts, Washington, D. C., and Princeton, New Jersey facilities. Please address Mr. R. L. Orey, SDC, 2432 Calleada Avenue, Santa Monica, California. All qualified applicants will receive consideration for employment without regard to race, creed, color or national origin.



The photo above: The Strategic Air Force SAC Control System. The map shows the continental United States with various flight paths and data points marked.



FOUR FLUIDYNE weather strain gage elements E-801 are in diameter base hub of new Pitotube. Two are bonded on under bottom side of the hub.

change and mass shift with temperature.

Compaq currently is offering the new PT 500 thermocouple strain gage transducers in gauge lengths and differential pressure ranges of 0.18, 0.35, 0.500 and 0.800 in. Transducers for the ranges of 0.1 and 0.5,000 psi are under development.

Division says it started its transducer development program following last fall's disclosure in Aviation Week (Feb. 1, 1960, p. 78) of the new approach to high sensitivity strain gages using thin whiskers of strain-sensitive material developed by Electro-Optical Systems. The article pointed out that the new strain-sensing devices appeared to have an effective gauge length (length of strainmeter) of about 175  $\mu$  compared with a figure of 21  $\mu$  for conventional strain gages. But it also noted that there were temperature compensation problems because strain-sensing fibers which are temperature sensitive.

Division says it has devised a better means of temperature compensation than strainmeter doping in one of thermistors, both of which reduce strain gauge sensitivity.

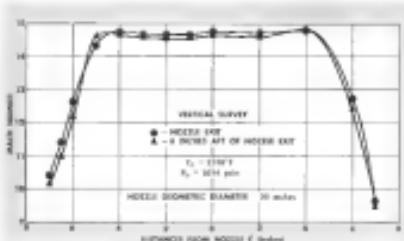
In the new pressure transducers, Division uses four strain whiskers, each approximately 0.001 in. in diameter and 100  $\mu$  in. in length, which are bonded to a constant temperature strain element in the transducer. As the element is inflated by pressure, the resistance of the whiskers is altered. Compaq says it is obtaining 100% factors of strain, that is, 1000

The new transducers, like others using strain gages require the use of a regulated, ungrounded 28.1 ac or dc source. Compaq says it produces a dc-to-dc converter which provides regulated dc voltage that is isolated from the power source.

Compaq says that it has obtained government contracts in the Herley, Pa., and Denver, Colo., areas to develop and qualify the new transducers with the FBI, a company spokesman says. This week's address is 45 Celeste St., Glenridge 42, N.J.

# MACH 14.7 DATA

The graph below presents calibration data of two stations downstream of the nozzle in the new **FluiDyne** Hypersonic Flight Simulation Facility.



THIS NEW **FluiDyne** FACILITY CAN PROVIDE YOU WITH TEST CONDITIONS AS FOLLOWING:

Mass No. .... 7.0 to 50  
Stagnation Pressure ...  $T_0$  2000 atm  
Stagnation Temperature ...  $T_0$  4680° R  
Exit Temperature ... 1 in. sec or 1 minute  
Flow Velocity ... Air

None Zeta, Suction, and Dynamic programs have been run or are scheduled.

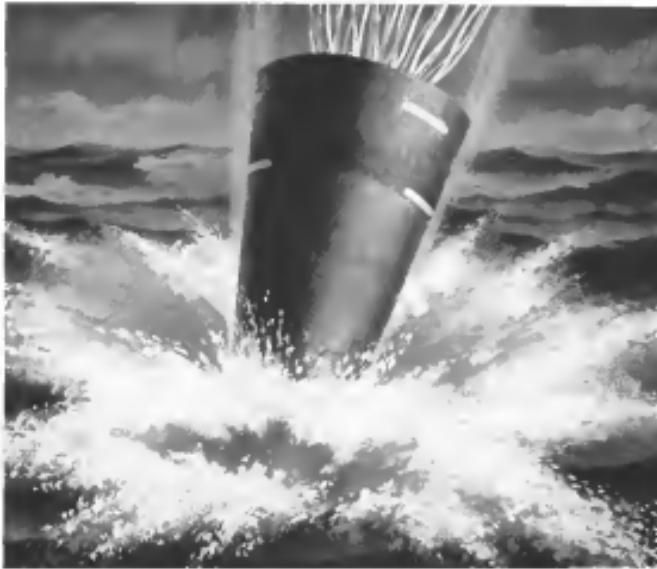
**FluiDyne** has the experience and facilities to help you with research, evaluation, or testing programs in ablation, heat transfer, force measurement, or base heating. Inquire now for detailed information about your specific requirements.



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## How the ocean grew "ears" to pinpoint missile shots

A quarter of the world grows from its blossoming pad as experimental missile nose cones splashes into the ocean.

How close has it come to the target?

Where can it be found, recovered and studied?

To answer these questions quickly and accurately, Bell Telephone scientists have developed a special system of devices. It's called the Missile Impact Locating System, or MILS for short. MILS, produced by Western Electric, manufacturer and supply arm of the Bell System, involves two types of networks:

- jacked up by hydrophones stationed at optimum depth and oriented toward the center of ground stations. Since the vibrations take longer to reach some hydrophones than others, time differences are measured to compute the location of the nose cone.

- The other is a "BellSonic" network which monitors a restricted target area. This network is so sensitive that no boost is needed. If it detects the mere splash of an incoming nose cone and precisely fix its location.

MILS is now operating in both the Atlantic and the Pacific nose cones. It was installed by the U. S. Navy with technical assistance from Western Electric.

It's still another example of how the universe of need — like the sea above the earth — makes space it's constantly being explored by the Bell Telephone System.

**BELL TELEPHONE SYSTEM**



AMERICAN TEL. & TEL. CO. / WESTERN ELECTRIC CO. / BELL TELEPHONE LABORATORIES / 21 OPERATING COMPANIES

## SPACE TECHNOLOGY

### Nimbus Uses Wheels, Jets for Control

By George Alexander

Philadelphia—Polar orbiting Nimbus meteorological satellite, with a spin rate during objects of deviating less than one degree in any axis, will use a reaction-wheel and pneumatic control system to maintain its contents in a constant earth-oriented attitude.

The attitude-control system, which also must support the instrument calibration requirement of less than one degree, is being built by General Electric's Missile and Space Vehicle Department, Philadelphia, Pa., for the National Aeronautics and Space Administration's Goddard Space Flight Center and consists of these major assemblies:

- Three flywheels, one for each axis, are actually the extremely mounted masses of three small 12-lb wheels as rotors.
- Two reaction wheels, with generation rates in the sensing elements.
- Two sun sensors, one for coarse orientation and the other to measure fine accuracy.
- Eight attitude-sensing jets, two for pitch, two for roll and four for yaw.
- Small digital computers, weighing 4 lb and rated at 55 words. It will be supplied especially by CIS for the Nimbus control system.

#### Control System Sequence

Functioning of the control system begins 2 sec after separation from the Finn Agora 2 booster and follows this sequence:

One pitch jet, fed from a spherical tank located directly below the instrument's center of gravity, adiabatic cold nitrogen, is fired for an attitude-holding pitch-position maneuver. After 18 seconds, a second 180 deg spin about the line of deviation, which fore and aft of the satellite for the horizon. Seeking a balance in the earth/space proportions seen by each, the sensors can't smell refuges which are amplitude and centroid in the coverage.

For roll correction, the computers compare the magnitude difference between the commands and commands in of the roll jet, inserted atop the longitudinal-shaped unit to reduce the heat of gas. Subsequently, to center pitch error, the computer fires only a signal waveform from the forward-looking sensor and activates other one of the roll jets, which by now is 180 deg from the pitch. The satellite should be roughly centered, within 1 deg of the desired position along the pitch and



**ATTITUDE CONTROL SYSTEM** An Nimbus meteorological satellite attitude reaction wheel and compressed-gas jets to reduce stabilization errors. Design requirements of less than one-degree position deviations and rate of less than .05 deg/sec around any axis. System is being built by General Electric-NYSD for NASA's Goddard Center.

roll axis and not rotating faster than .01 deg/sec. If so, the pneumatic orientation has accomplished coarse orientation and is shut down.

To bring Nimbus within 1 deg along an axis, the computer now feeds the roll data through an amplifier to the upper-stage thruster. Each 1-in. diameter 4.7-lb wheel is spun up to a spin velocity in the upper voltage and the nose cone is rotated to bring the sensor in the roll direction. Once the roll has leveled, the spin is reduced, the upper voltage is effectively cut off, the signal is stopped and the wheel should stabilize in its intended position. In actual operation CIS and NASA expect that single overshoot can occur, but that small additional corrections by the wheel will stop the satellite right on line.

Each pitch jet has a threshold detector which serves two purposes: initially it acts as the pneumatic system when the position and rate can move 180 deg beyond the 180 deg. On the second pass, the detector is the sensor that monitors the pitch and therefore monitors the 180 deg of the wheel as it completes the 360 deg cycle. The detector then activates the jets to damp the wheel back to zero spin, which the saturation point of 1,280 rpm has been reached.

At 180 sec, the entire ten-second array of eight solar cells—hook the sun down and gradually bring the sun down to less than 1 deg, again at a rate not to exceed .05 deg/sec. When the sun falls below this same level an attitude switch transfers one control to a rate-steering gear which combines both the yaw and roll rates into a single signal for a longer duration. For the last 10 sec, the yaw rate control switch is rapidly opened and closed until the Nimbus is within 1 deg. .05 deg/sec design parameters.

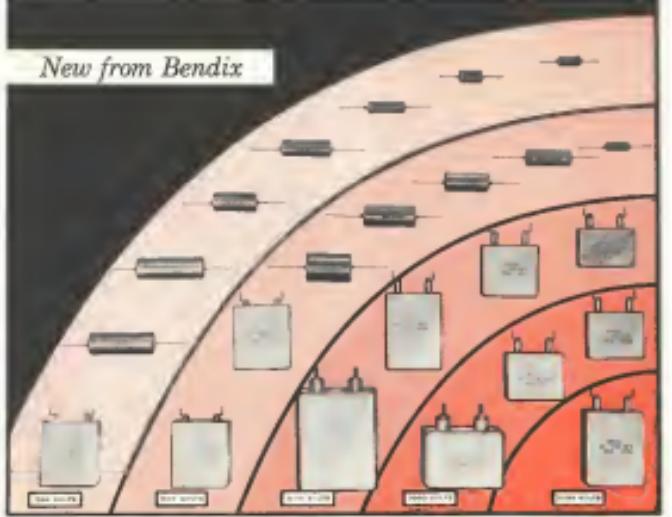
#### Stability Achieved

At the moment after separation, the Nimbus should be stable in all three axes and ready to turn on its various sensors (AW, June 26, p. 27).

Solar paddles, which will probably develop 8.16 amp, are opened 2 sec after separation from the booster. A sun sensor, mounted on the paddle shaft provides signals to a drive mechanism which rotates and maintains the paddles perpendicular to the sun's rays. During light periods, the paddles are directed to the sun to maintain within 10 deg.

The system's final sun sensor is used to check drift in the sun gear. A

New from Bendix



## E-200 HIGH TEMPERATURE CAPACITORS

Operable to +200°C.

The Bendix® E-200 series of lightweight, small size capacitors is designed for installations requiring a high degree of component reliability at operating temperatures as high as 200°C.

High temperature capability and micro-like electrical characteristics enable the E-200 series to withstand extremely high orders of AC in small envelope size at 500 mils under 200°C. The new series is designed and manufactured

to a Bendix specification which is patterned after the high reliability specification MIL-C-14157B, proposed.

Hermetically sealed in tubular or rectangular housings, these capacitors offer superior resistance to mechanical and climatic environments.

**E-200 CHARACTERISTICS:** • Wound micro paper • Gold segments • Heretrical stability • High insulation resistance • Radiation resistance • Outstanding dependability

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**PROTOTYPING** of the Shallow control system is now being tested at GE's Philadelphia plant. All subsystems are presently breadboarded configuration, but in operational vehicles will be transitioned to 125-space encapsulated modules housing full panels of the basic structure. Note one of two infrared sensors mounted on cover of hermetically sealed unit.

closed loop with a very narrow drift or zero, sole and solar cells on the opposite side of the sensor. On a 1/16 in. thick wafers the sensor is oriented at 45° to the surface and 90° to the satellite's local vertical. The resulting output voltage is referenced back to ground through three resistors parallel with the output of the gimb. If drift is observed, ground stations will command a bus to be introduced into the sun-sensing amplifier to maintain the

100°C by the opening and closing of shorters situated on opposite sides of the sensor. On a 1/16 in. thick wafers the sensor is oriented at 45° to the surface and 90° to the satellite's local vertical. The resulting output voltage is referenced back to ground through three resistors parallel with the output of the gimb. If drift is observed, ground stations will command a bus to be introduced into the sun-sensing amplifier to maintain the

### Six-Month Lifespan

The system's six-month estimated lifetime is based on the capture of the anticipated nitrogen supply. Kite needs no fuel throughout the mission, with such features as solid gold ball bearings and ceramic dampers.

Power consumption of control system is 25 watts. The 5.4 x 20 in. system have 25% excess of fuel winding and 0 to 25°C on the control winding.

GE has already built a preproduction model and is now testing it at its Philadelphia facility. Prototyp model is to be delivered with operational units is expected to be delivered to Goddard before the end of first year.

## Space Subsidiary Of Aerojet Is Formed

Washington—Sperry-General Corp has been formed as a subsidiary of Aerojet General Corp. to design and develop missile and space systems, with plans to employ 1,000 accounts and support 10,000 by next February.

The voluntary combination Aerojet's Spacecraft Division and the recently acquired Space Electronics Corp. President is Dr. James C. Fletcher, who headed Space Electronics, Santa W. Lakin is executive vice president.

Aerojet will continue work on propulsion, infrared, electrostatic sensors, hydrogen maser and thermal. Space-General will continue its professional programs on the Apollo Sat., Asteroid and Asteroid vehicle systems, manufacturing for the Ranger, the Deepwell deep space telemetry system and revised guidance for satellite entries.

Dr. Fletcher and the company intends to bid on the Saturn S-1 engine stage and is preparing search and rescue satellites and a lightweight Prospector spacecraft capable of sampling the lunar surface in a Circular orbit. The light Prospector, weighing about 300 lb., would be based on the Surveyor design.

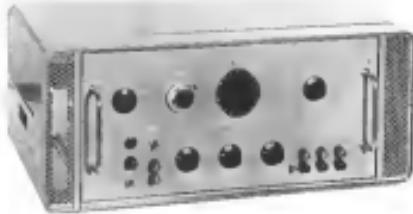
Aerojet President, Dr. A. Kusel and Sperry-General's largest software of the east on the firm's dual team is expected to be \$10 million. The new division, which gives into operation units about 700 employees will be housed in a new plant to be built on a 7-acre site east of Los Angeles on the San Bernardino Freeway.

## Mercury-Scout I To Check Out Tracking

Washington—Earth-orbiter space probe, codenamed 104-1, of Mercury capsule communications equipment is being built by Aerospace Division of Ford Motor Co. for launch by a Mercury Scout rocket on about the May 1 tracking vehicle.

The probe, which is described as much by Aerovox's Wm. H. Bass (See p. 31) is scheduled for late summer. National Aeronautics and Space Administration said that the communications equipment will be placed in a 500-mi circular orbit to provide test facilities, operator training and orbital flight test.

Test will be critical. Mercury Scout I and the satellite will be useful as long as the battery remains active. The communications system is powered by solar panels and consists of UHF and VHF transmitters-receivers, two general command receivers, two identifications and C- and S-band tracking beacon.



# WIDER RANGE WITH GREATER ACCURACY!

This Vought Electronics Servo Analyzer is an all-electronic instrument covering the dynamic range of most servo systems without the troublesome maintenance requirements of mechanical multipliers.

Modulation rates of .005 to 1000 cps in five ranges are provided in sinusoidal, step, and ramp functions either directly or in suppressed carrier form. Modulation frequency accuracy readings of 2% are possible.

Other important unit specifications are:

- carrier frequency range of 50 to 16,000 cps
- carrier phase shift of less than 2° to 5 kc
- signal attenuation of 0 to 99 db in 0.1 db steps
- phase measurement accuracy of 2°

Use of Vought Electronics Servo Analyzer has been demonstrated successfully with Titan and Minuteman missiles as well as in industrial laboratory applications. It is available in both bench and rack mounted models.

For more complete information about this versatile instrument, contact:

**Chief of Product Sales**  
Chance Vought Electronics Division  
P. O. Box 1500, Arlington, Texas

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ANTENNAS • AUTOMATIC CONTROLS • NAVIGATIONAL ELECTRONICS • GROUND SUPPORT ELECTRONICS

## USAF Contracts

Following is a list of specialized contracts for \$25,000 and over as released by U. S. Air Force contracting offices.

### REAGOR AIRTECH, AERONAUTICAL & SPACE DIVISION, WILMINGTON

Aerospace Division General Motors Corp., Indianapolis, Ind., guidance systems for the aircraft navigation system, contract and letter contract AF 33(656)101 dated Mar. 9, 1961, \$100,000.

The Aerospace Test & Systems Co., Akron, Ohio, aircraft navigation system, AF 33(656)101, aircraft navigation system, letter contract AF 33(656)101 dated Mar. 9, 1961, and letter contract AF 33(656)101 dated Mar. 24, 1961, to conduct AF 33(656)101 dated Mar. 24, 1961.

The Aerospace Test & Systems Co., Akron, Ohio, aircraft navigation system, AF 33(656)101, aircraft navigation system, letter contract AF 33(656)101 dated Mar. 24, 1961, and letter contract AF 33(656)101 dated Mar. 24, 1961.

Air Force Department General Electric Co., Schenectady, N.Y., electronic equipment, aircraft navigation system, letter contract AF 33(656)101 dated Mar. 24, 1961, and letter contract AF 33(656)101 dated Mar. 24, 1961.

Kellogg Instrument Co., Indianapolis, Ind., aircraft navigation system, letter contract AF 33(656)101 dated Mar. 24, 1961.

McDonnell Douglas Corp., St. Louis, Mo., aircraft navigation system, letter contract AF 33(656)101 dated Mar. 24, 1961.

McDonnell Douglas Corp., St. Louis, Mo., aircraft navigation system, letter contract AF 33(656)101 dated Mar. 24, 1961.

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McDonnell Douglas Corp., St. Louis, Mo., aircraft navigation system, letter contract AF 33(656)101 dated Mar. 24, 1961.

# NEW FROM WESTINGHOUSE



## ULTRAVIOLET COMMUNICATION SYSTEM FOR SPACE

Westinghouse scientists are developing a new kind of space communication system. Called Ultracom, it will use a beam of ultraviolet light, modulated to convey information.

In a space vehicle, the electrical supply and volume are limited. Here Ultracom will have many advantages over radio. Because UV frequencies are higher than radio (a million times—signals are disturbance free and can be sent faster with less power, 50 million miles, for example, with a radiated power of 1 watt). Ultracom will require far less area for antennas, and reliability will be high because of equipment simplicity.

Westinghouse scientists were the first to achieve communications by ultraviolet. Development of the Ultracom system for space application is another example of how Westinghouse is Pioner with the Future Defense Products Group, 1000 Connecticut Avenue, N.W., Washington 6, D.C.



**Westinghouse**

# Whispers...from Venus

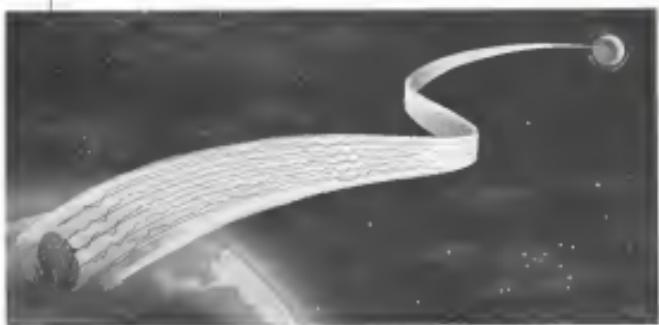
From March 10 to May 10, 1961, JPL's Deep Space Instrumentation Facility at Goldstone, California, conducted an important radarbounce experiment directed at the planet Venus and hundreds of hours of scientific data were collected. The results obtained helped establish the United States as the leader in the new science of planetary radar astronomy.

Prior to this experiment, the Astronomical Unit (AU) contained an uncertainty factor of 60,000 miles which JPL scientists have now been able to reduce

to 1,000 miles—possibly 100 miles—as one of the results of this effort.

Establishing a more accurate value for the AU will enable JPL to measure the exact distance to Venus prior to the launching of the first U.S. Venus probe.

One of the most important conclusions to be drawn from this successful experiment is the knowledge that we can now design a planetary radar observatory capable of almost continuous surveillance of Venus, Mars, Mercury and Jupiter. Therefore, March 10, 1961 marks the beginning of a new era in space technology and exploration.



This scientific accomplishment is only one of the many research programs in progress at JPL under its space exploration responsibility to NASA. These extensive investigations into the science and technology of the space environment offer real and stimulating incentives to an inhibited scientists and engineers with searching minds. JPL needs such men, who look forward to rewarding careers in this uncharted field.

Resumes and inquiries directed to A. W. Locke, Manager of Professional Placement, will receive immediate attention.



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If you're the kind of engineer who enjoys working with hardware in the field and thrives on eight-hour schedules, then you'll be interested in a field assignment with General Dynamics/Astronautics.

Positions in field service, base activation, and flight test engineering exist now at Atlas bases and test sites throughout the United States. They require individuals with broad technical ability, sound judgment and a strong sense of responsibility. In turn, they provide tremendous technical challenge and the satisfaction of being a frontline participant in the free world's greatest deterrent to aggression—the Atlas weapon system.

If you have a degree in engineering and qualify as an expert in the field put all the facts. There's more information on the next page, and you'll find a convenient inquiry card attached. Why not mail it today? There's no obligation, of course, and it will be immediately acknowledged. Prompt interviews will be arranged with qualified respondents.

If the inquiry card has been removed, or if you wish to forward or request more detailed information, please write to Mr. R. M. Senn, Industrial Relations Administrator-Engineering, Mail Zone 130-90, General Dynamics/Astronautics, 3625 Kearny Villa Road, San Diego 17, California. (If you live in the New York area, please contact Mr. T. Coone, manager of our New York personnel office, c/o General Dynamics, 1 Rockefeller Plaza, New York City, telephone Circle 5-5034.)

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The target is a Northrop drone. The countries using it are Belgium, Canada, Denmark, Great Britain, Iraq, Italy, Japan, Nationalist China, Netherlands, Portugal, Republic of Korea, Spain, Sweden, and West Germany. Northrop target drones and missiles, surveillance drones, and complete support systems are built by

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**NORTHROP**

## New Offerings

Vanna Associates, Palo Alto, Calif., the company and its subsidiaries are engaged in the design, manufacture and sale of numerous valves, electronic instruments, various equipment and electronic systems and components for nuclear, commercial and industrial use. Offering is 147,855 shares of capital stock for subscription by stockholders at the rate of one six shares for each 10 shares held, based on subscription price and underwriting terms to be supplied by underwriter. Of the proceeds the company proposes to use approximately \$1,570,000 for construction of a new building of its present plant at Palo Alto and for a new plant in Lexington, Ky. \$1,160,000 will be expended during the balance of 1961 and \$4,500,000 during 1962 for additional equipment required for expansion of the company's productive capacity. \$1,500,000 will be allocated for acquisition and development of an additional plant site; an unspecified amount of bank borrowings will be retired, and the balance added to working capital.

Advanced Scientific Instruments, Inc., Minneapolis, Minn., organized under Minnesota law on March 1, 1961, the company proposes to engage in the business of developing, manufacturing, selling and leasing electronic, electro-mechanical and electro-optical equipment for scientific purposes. Categories of scientific equipment are: atomic and particle accelerators; data handling and processing; data recording; data communication; data conversion and guidance and weighting. Offering is 875,000 shares of common stock for public sale at \$1.15 per share. Of the proceeds (plus \$112,000 proceeds from the sale of 112,000 common shares to the promoters), \$100,000 will be used for equipment manufacture costs and leasehold improvements and \$10,000 for the balance for development costs. During the first year of operations, 60% of general working capital (including retained, short-term and working

Anchor Corp., Boston, Mass., engaged in the design, development and manufacture of high-speed protein and high-speed paper tape readers for use in association with computers and electronic data processing equipment or systems. It is also engaged in research, development and manufacture of other electronic and electro-mechanical instruments and components. A subsidiary is engaged in producing tributary membrane and membranes for industrial and government agencies. Offering is 17,284 outstanding shares of common stock.

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**CHEMICAL INDUSTRIES, INC.**  
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## Airborne DC Amplifier



Small, solid state, direct-coupled DC amplifier weighs only six ounces. Less than five cubic inches in volume, this rugged, hermetically sealed instrument is available with solder, plug-on, case or combination header arrangements and a variety of mounting. DC gain is 250 to 1000  $\pm$  0.75%. Input capability is 5 millivolts differential at maximum gain; output capability is  $\pm$  5 volts into no less than 20K (single-ended).

Microdot Inc., 220 Pasadena Avenue, South Pasadena, California.

## Temperature Transducer



Small probe-type device for high and low temperature applications where high precision and severe flow conditions are imposed. Precise liquid or gaseous measurements to 800°F. Tiny sensing element of deposited platinum film allows high base resistance, extreme linearity, wide range capability, and fast response. Approved for ICHM applications.

Microdot Inc., 220 Pasadena Avenue, South Pasadena, California.

## VHF-UHF TRANSMITTERS



Previously in history's most demanding environmental laboratory — radio space — the easily programmable transmitter always is typical of the demanding skill and precision required to produce reliable space equipment. The unit shown is a measurement, polarization, and frequency-selectable power supply that cannot be damaged by input line input overloads. Models are available in a complete range of modulations — CW, FSK, Phase, and Pulse, with frequency coverage 180 to 8000 mc/s and output from 100 mc/s to 10 MHz.

Telmetry Capabilities of Microdot have been dramatically expanded with the recent acquisition of Spectravac Instrument Company. The highly regarded development skill, production capability, and working experience of Spectravac in the field of VHF and UHF receivers and related instrumentation is available to Microdot. Microdot's broad range of space equipment, automation, or instrumentation polarization and capabilities, as a vital part of such important projects as Pioneer V, Pioneer Atlas, Ranger, Mariner and Echo I.

UHF Telemetry Transmitters, Models 2406 and 2409, are a unique automatically stabilized circuit, with the output frequency referenced directly to a quartz crystal. This approach allows a greatly reduced size compared to the multiplier type circuit usually required to achieve crystal stability, as well as increased reliability due to a fewer number of parts.

The transmitters have three open solid state power supply designed to provide a high ratio of output power to input power used. The frequency modulation smoothness is sufficiently great to introduce complete amplitude distortion to the measurement signal. For further information, call Microdot or write for catalog sheet TT-1.

### SPECIFICATIONS

Frequency Range	1300-1500 mc/s
Model 2406	1475-1500 mc/s
Frequency Stability	$\pm$ 0.001%
Power Output	10 watts
Size	14" x 7" x 5"
Weight	14 lbs.
Modulation	FSK, Phase, Pulse
UHF Voltage	25 vdc
Temperature Range	-40° to +20° C
Dimensions	10" x 7" x 5"
Weight	10 lbs.
Options	12 pounds

### MICRODOT INC.

220 Pasadena Avenue, South Pasadena, Calif.  
Hollywood 2-3393 • Directors 9-9171



for public sale from time to time by the holders thereof on the over-the-counter market at prices related to the current market price of the firms of sale. Offering also includes 100,000 common shares, issued by the use of five selling shareholders, which are subject to purchase by three persons to whom options have been granted to purchase at \$7.19 per share. \$4,695 common shares previously registered with the SEC, and which underlie warrants which were attached to an issue of debentures previously sold when the company was incorporated after January 1, 1961, at four \$16 to \$17.50 per share. Proceeds from the exercise of the warrants will be added to the company's working capital.

Bobtron Instruments, Inc., Denver, Colo., engaged in the design, manufacture and sale of elecro-power recording instruments for the electric utility industry, electronic measuring and testing instruments for commercial and military use, and airborne instruments used in certain phases of missile tracking. Through wholly owned subsidiary, the company is engaged in the development, manufacture and sale of video, infrared, potentiometric, practical microwave, airborne, automotive, lightning, analytical, and electronic classified instruments, industrial electric motion and vibration, gas analyzers, electronic and dielectric heating devices, plasma wave, and liquid-state component used in the control surfaces of jet aircraft and missiles. Offering is 141,298 shares of common stock of this stock, an unadjusted amount (up to 90,000 shares) to be offered for public sale by the present holders thereof.

Socier Capital Corp., Philadelphia, Pa., engaged in the Pennsylvania Inc. on March 1961, the company is a wholly owned subsidiary. The company was acquired by Socier in May 1961 under the Small Business Investment Act of 1950 and registered as a closed-end, non-diversified management investment company under the Investment Company Act of 1940. Business will consist of investing capital, through the purchase of equity and debt securities to selected small business concerns engaged principally in the field of applied sciences and modern technology, long-term loans to such concerns, providing advisory and management assistance. Funds will be invested in research and technical assistance to such concerns in which the company has an interest, and in the form of a loan to the company.

Offering is 470,000 shares of common stock for public sale at \$5 per share, offering to be made on an as is or with loss basis. Proceeds will be used to provide investment capital and management services.

AVIATION WEEK, July 10, 1961

# TAPE TAMER



### NEW EECO HIGH-SPEED MAG TAPE REWIND UNIT \$690, 6 WEEKS DELIVERY

Tame your tape rewinding problems at the industry's lowest cost for all these features: Fast automatic stop when tape ends or power fails. Rewinds 100% in 7 sec. seconds. Constant tension for unusually even winding. Tension selector. Universal hub accepts NAB, UNIVAC or IBM reels. Precision guides handle  $\frac{1}{2}$ ",  $\frac{3}{4}$ " or 1" tape without adapters. Unit takes reels up to 34" diameter. Operates on 115v ac, 60 cps, 150 v. Initial availability 6 weeks. Send for Data File TR-301.



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FOR OTHER MISSIONS**

"Mission module" design of the new, twin-turbine-powered, Boeing-Vertol 107 makes this truly versatile helicopter can perform a wide range of military assignments—without costly or time-consuming conversion. A change from cargo mission to minesweeping can be made possible because of basic design.

In addition, an integrated landing system can be installed on the gear system of an all-weather helicopter. With the new system, the gear walking alone can land up to two tons of military cargo in three minutes or less. Even under demanding field conditions, landing can be completed as an little as eight minutes. The fully integrated system is now landing gear. It features precision landing gear, which is a major improvement over the Verteil 107, seven to 10 grades for vehicle wheels. A full-time hydrostatic wheel speeds landing, while the use up ground attitude permits full gravity or load unloading. The landing system does not interfere with use of the Boeing Vertol 107 as troop transport, and troop seats can be quickly moved along the fuselage to accommodate other "passenger models," such as AWB, land or sea rescue, medical or evacuation, mine-clearing.

The Boeing Vertol 107's capability to perform many missions such as these makes it the logical choice for logistic, medical, and short-haul forces.



**VERTOL** DIVISION  
McDonnell  
PENNSYLVANIA  
**BOEING**

— V — ROEING

## SAFETY

On 151373Z at 0600 hrs on March 17, 1944, a  
Heinkel He 111, model H-13, Wk. No. 110142,  
was shot down and crashed by Northern Andre-  
wes, crashed approximately 10 miles from  
the village of Tschirnau, about 100 miles of the right  
hand side of the Elbe River. All 10 persons on board were killed.  
Flight 790 departed Chicago Illinois at  
0800 hrs, en route to London, England. Nonstop flight  
of 10 hours 45 minutes.

15,000 feet. All reporting points were made at the same time and the flight was progressing according to plan, no messages were required. It was indicated that the crew of Flight 1180 was experienced in representing any difficulties.

The first call was made at the instant that the aircraft reached the 15,000 foot altitude, and that the weather was considered sufficient to flight the right wing position. The author of the message and the identity of the service men in the area of ascent were not mentioned.

2016-2017学年上学期第三次月考

Northwest Airlines Flight 110 of March 1958, a Lockheed Constellation, serial No. 110, was en route between Minneapolis and St. Paul, Minnesota, with an intermediate stop at Duluth, Minnesota, en route to Chicago, Illinois, via the Twin Cities. The crew consisted of Captain E. LaFollette, First Officer Joseph C. Do, Flight Engineers Arnold W. Koenig and John C. Johnson, and Flight Attendants A. Schlesinger and Flight Attendant

After the digester was heated to the proper temperature, the gas was collected and tested for the presence of methane. This heating consisted of a gas inversion of the anaerobic mixture, a 10% of the gas being removed and replaced with air. The methane content of the gas was measured and the methane content was noted. The anaerobic and the digestate tanks which were located in Florida discussed as well as the viscosity of the digestate. The viscosity of the digestate was measured and the viscosity as it appeared to be growing as an estimate. No mention was made, however, of any skins or turbidities being present.

A flight plan was prepared which indicated a flight to Anchorage, with intermediate stops at Unalaska (1976) via Vuctor Airline 2, 97 miles to McRae, a crossing ahead of 1000 feet, a time enroute of 148 hours, and an estimated time en route of 51 hours.

The flight departed Minneapolis at 1457 and arrived at Midway at 1515, the trip to Chicago was finished. It should be noted that the majority of the passengers and the head of Chicago will very hard others will continue to do so.

It was a natural training for every reporter. During this short time the tourist was gassed at Chicago, apparently illiterate, it was refuted and prepared for publication. Once here, we Central Americans

Chicago at the start of the accident and 40 more were reported by police to have been in 7,960 feet near Chicago and by noon, 1,000 to 6,000 feet between Perryville, Indiana, and Louisville, Kentucky. Obviously such conditions prevailed above these cloud formations with sufficient velocity to penetrate the United States.

Horizontal Shear  
Horizontal Shear at 10,000 feet=79 lbs/s  
118 N 34  
at 10,000 feet=52 lbs/s 118 N 34  
Vertical Shear  
Vertical Shear  
10,000-15,000 feet=10 lbs/s  
1,000 lbs/s  
Droop= 35 lbs/s-15,000 feet=3.5 lbs/s

10,000 feet  
Wind shift soon enough  
At 15,000 feet, 10 degrees between Pima  
and Davis  
40 degrees between Pima and Neth-  
ville  
At 16,000 feet, 40 degrees between Pima  
and Davis  
10 degrees between Pima and Neth-

Horizontal Shear at 16,000 feet/mile / 150 24 M  
at 17,800 feet/mile / 150 24 M  
Vertical Shear

Diego, 16,300; F, 2,800 (cont'd)

1107 1108

1300 e. s. t., 10 miles west Dayton, and east of the Ohio River in alluvium. 20,000 ft. above sea level. 400 feet thick. (P-161)

1480 e. s. t., Cincinnati: moderate to heavy alluvium. 10,000 ft. to 25,000 feet. T-21.

1480 e. s. t., New Hope, Kentucky: clayey sand 20-30 ft. of 100 ft. of glaciogenic till. T-21 at edge of glaciogenic area. Disturbed and glazed green sand pebbled fluviumite and talus.

1510 e. s. t., Columbus, Ohio, at York: moderate to severe alluviation. 10,000 ft. above sea level. 8-10 feet glaciogenic till. T-21.

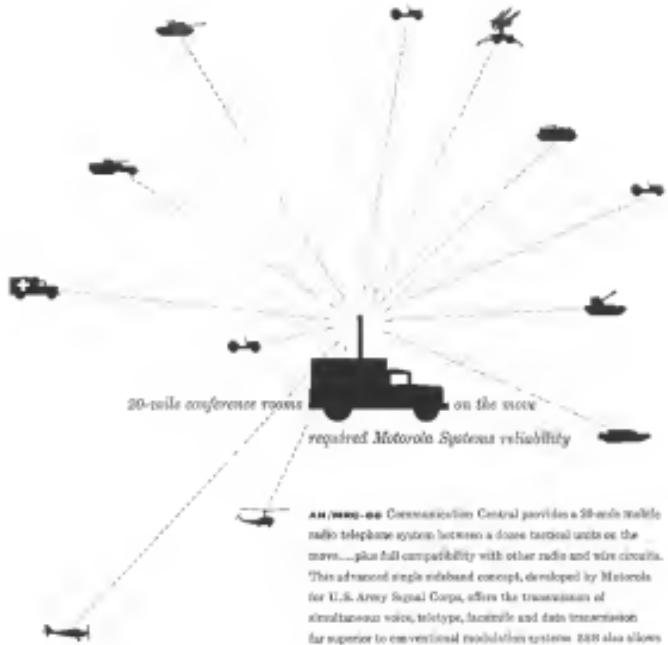
1510 e. s. t., Louisville, Kentucky: moderate to severe alluviation. 17,000 ft. to 25,000 feet. T-21.

1510 e. s. t., 10 miles west Louisville: moderate to severe alluviation. 17,000 ft. to 25,000 feet. T-21.

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**AN/PRC-66** Communications Central provides a 28-unit mobile radio telephone system between a dozen tactical units on the move...plus full compatibility with other radio and wire circuits. This advanced single-receiver concept, developed by Metacore for U.S. Army Signal Corps, offers the transmission of simultaneous voice, teletype, data link and data transmission far superior to conventional radio-link systems. Rugged and reliable, the PRC-66 allows many channels in a given portion of the crowded RF spectrum and provides a wide range of communications options.

Control issues uniform signal reception regardless of whether vehicles are deployed 100 feet or 10 miles from the Central. Three operating modes - Normal, Ir-Channel Net and Emergency Net - enhance the basic system flexibility. Simplification inherent in Motorola's concept and modular design affords the highest possible degree of reliability and maintainability in the field. Detailed information is available on request.

## Military Electronics Division



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are essential to success**

heading of the sunwise path was approximately 30 degrees or at such right angles to the flightpath, with the lesser of the colored pairs, found at the west end and the least dense at the east end.

The remaining components of the aircraft, propellers and propellers were transported by *Viasat* helicopter to an area near the center. There that location all of the salvaged aircraft structure was transported in a C-130 aircraft to the Lockheed Aircraft Corporation at Burbank, California, for further examination. The powerplants were immediately transported to the Allison factory in Indianapolis, Indiana.

## AIRCRAFT STRUCTURES

Study of the wreckage and wreckage debris at the scene of the accident disclosed that the outward propeller and engine assembly structures, the complete right wing, and the outer portions of the left wing and fuselage separated from the rest of the aircraft in flight during such a short time interval that the separation of these parts was not apparent. In addition, the right wing wreckage was found to be completely disintegrated and unidentifiable.

To facilitate the necessary detailed study of the wreckage, 'assemblies' of different parts of the aircraft were made at a survival site at the Lockheed factory. Primary structural components and the outboard engine support structure were on the inboard section of the right wing. A much smaller portion of the structure was recorded in Figure 10a. Components of the aircraft were used in comparisons with the rest of the wing, the horizontal stabilizer and the aircraft itself. Flight control system parts of fuselage wreckage were examined with great care.

Nonmolar fractured pieces of dentin were subjected to microleaching examinations and analysis in the Tokushima laboratory. These examinations disclosed an absence of organic staining nonleaching material in the fractured dentin, or missing attack areas. This data validly indicates an in the absence of acidic maceration. Polycarboxylic acid

Illustration of the fuselage, the vertical tail, the landing gear and the flight control systems disclosed no indication of malfunc-  
tion or failure prior to impact with the  
ground other than normal system failures  
arising from the right wing separation in  
flight.

The only indication of emaciation is in the hirsute tail, prior to impaction the growth was that of the pores of the skin, now instead of the pores of skin there are 5-8 elongated and flattened irregular openings, which are 1-2 mm. in diameter, the excretion appears to be in the form of a thin, yellowish, pasty substance, the excretion appears to be in the form of a thin, yellowish, pasty substance, and very shortly before the main discharge comes the gurgling. The repetition of this symptom can have no connection with the result given in the article, as a result of repeated observations of the disease, it is known that the result of dislodging the worms is the ending of this disease. This disease is peculiar to the

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Employee Name	Employee ID	Employee Name	Plan ID	Plan Name	Secondary Vesta date Received for Review
EDDIE HED	649-206	EDDIE HED	55198	55-0-20649	EDDIE HED as presented by 55-0-20649
EDDIE HED	6,000	EDDIE HED	4750	10-0-6000	24-0-6000. Eddie HED as presented by 10-0-6000. 4750 and additional Eddie HED entries
EDDIE HED	32-205	EDDIE HED	4-855	32-0-205	32-0-205. Eddie HED as presented by 32-0-205
EDDIE HED	12-004	EDDIE HED	T-001	12-0-004	12-0-004. Eddie HED as presented by 12-0-004

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## Electronic Engineering Company of California

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For full particulars, see the Yellow Pages for the MICRO SWITCH branch office, or write for Catalog 77.



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MICRO SWITCH Precision Switches

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been overlaid, detailed study of the flight wing technology as previously mentioned disclosed no structural damage or deformation due to heat generation of the aircraft.

A series of other National Aeronautics and Space Administration investigations disclosed no evidence of any significant damage or degradation due to heat generation of the aircraft.

This is the first half of the CAA report on the study of a National Aeronautics and Space Administration aircraft on May 10, 1980. The concluding portion of the CAA report will appear in a subsequent issue of Aviation Week.

## Convair 880 to Test Runway Slush Effects

Washington — Federal Aviation Administrator is using the effect of slush on jet transports' takeoff performance as a test in accelerating a Convair 880 aircraft to 100 mph, speed on a runway coated with antifreeze ice or a substance that simulates it, drag.

Scheduled for the summer at either Dulles International Airport here or at TPA's Atlantic City, N.J. experimental center, the test program is expected to furnish background data for an agency rule on slush runways.

Wright pointed to the importance of jet transports taking off from slush-covered runways and responsibility for ensuring slush depth were unknown at first when FAA officials met recently to discuss how to take proposed sub-representatives of the U.S. Weather Bureau, airport managers and the airline industry.

All parties at the two-day conference disagreed responsibility for ensuring the volume of slush on any given runway at any given time (AW, Apr. 18, p. 31).

However, a suggestion that the job be given to joint airline "user" committee, which regulates the flow of traffic at major terminals during bad weather, commanded little opposition at the meeting.

On the specific question of slush management, the Weather Bureau pointed out that its attempts to measure snow and ice now often end up at zero in March or April.

However, the overall effect of slush accumulation is being determined by some European countries by dragging an instrument wheel down a runway, then extrapolating the resistance as measured.

FAA admits that "very little is known" on the effect of slush on the braking capacity of wheels and hence an accurate stop distance in standing water was not yet settled on. The agency feels, however, that National Aeronautics and Space Administration tests provide enough data for an "adequate regulation" to be developed taking accountability in slush.

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just  
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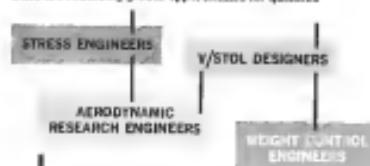
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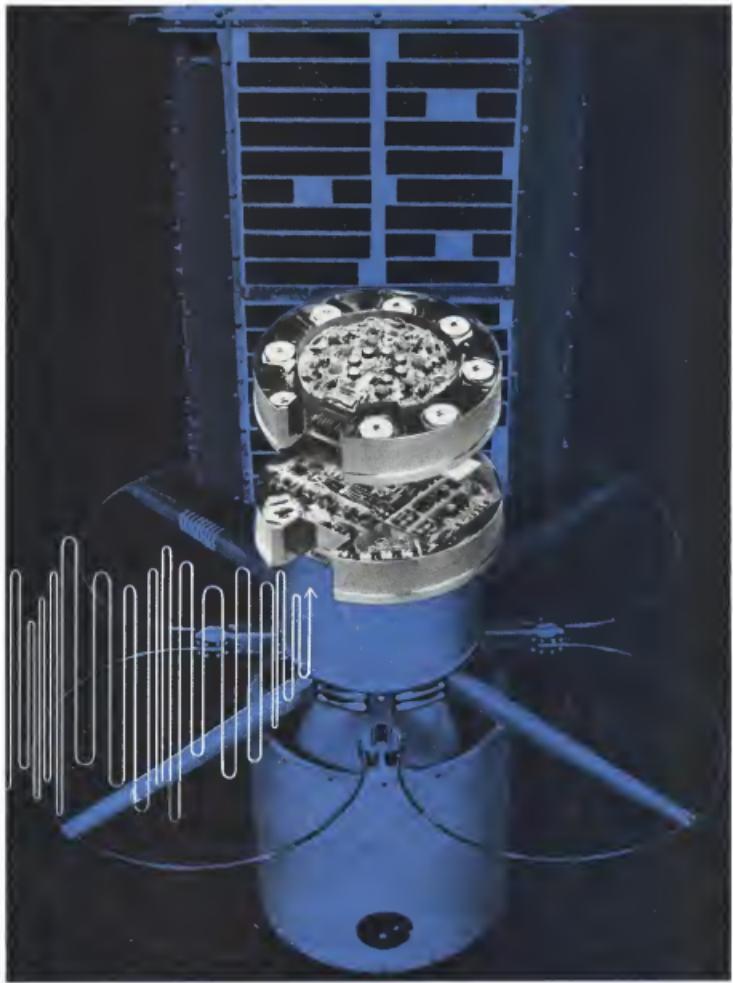
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